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NATIONAL DAM INSPECTION PROGRAM. THORNES DAM (INVENTORY NUMBER --ETC(U)
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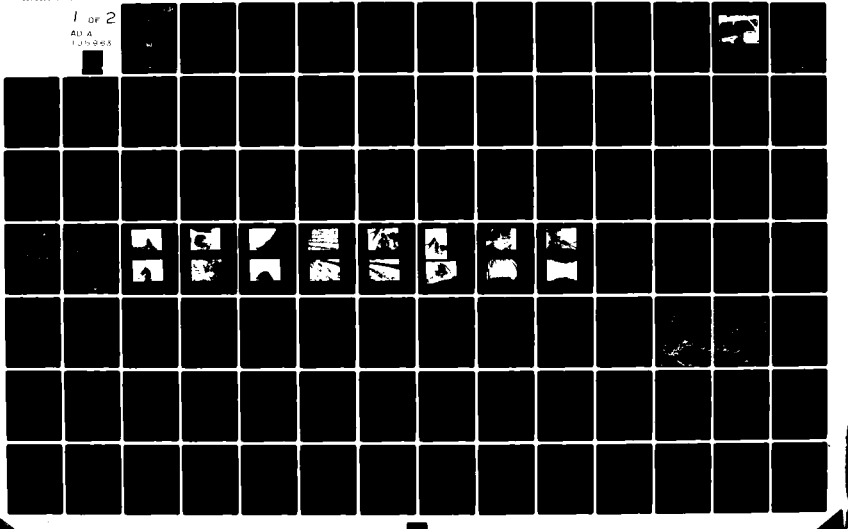

HOUSATONIC RIVER BASIN

TOWN OF AMENIA

DUTCHESS COUNTY, NEW YORK

(3)

LEVEL II

THORNES DAM

NY 00793

(10) Kenneth J. /Male
W. M. /Smith, Jr

(15) DACW51-81-C-0014

PHASE I INSPECTION REPORT

(6) NATIONAL DAM INSPECTION PROGRAM,

Thornes Dam (Inventory Number NY 00793).
Housatonic River Basin. Town of Amenia.
Dutchess County, New York. Phase I Inspection
Report.

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, NY 10278

(12) 17

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Thornes Dam
Dutchess County
Housatonic River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some serious deficiencies which require further investigation and remedial work.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Hydrologic and hydraulic analysis indicates that maximum spillway discharge capacity is only about 6% of the PMF peak outflow. The 1/2 PMF would overtop the stone masonry dam. Structural stability analysis, as well as visual observation, indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, the spillway is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

Therefore, it is recommended that within 3 months after receipt of this report by the Owner, a detailed hydrologic and hydraulic analysis be started to better assess spillway capacity. Within 18 months after receipt of this report by the Owner, any appropriate remedial work should be completed. The detailed analysis and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

In the meantime, the Owner should immediately institute a program to visually inspect the dam and its appurtenances at least once a month. Also, within 3 months after receipt of this report the Owner should complete development of a surveillance program for use during periods of heavy runoff and of an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

Structural stability analysis of the stone masonry dam indicates that the overflow or spillway section is unstable for all loading conditions, including the normal spring-summer-fall condition and the winter ice load condition. Therefore, it is recommended that a detailed structural stability analysis of the stone masonry dam under all loading conditions be started within 3 months after receipt of this report by the Owner. This analysis should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dam. Any necessary remedial work should be completed within 18 months after receipt of this report by the Owner. The investigation and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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THORNES DAM, NY 00793

PHASE I INSPECTION REPORT

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PHASE I INSPECTION REPORT

Identification No.: NY 00793

Name of Dam: Thornes Dam

State Located: New York

County: Dutchess

Municipality: Town of Amenia

Watershed: Housatonic River Basin

Stream: Wassaic Creek

Date of Inspection: May 5, 1981

ASSESSMENT

Examination of available documents and visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some serious deficiencies which require further investigation and remedial work.

Hydrologic and hydraulic analysis indicates that maximum spillway discharge capacity is only about 6% of the PMF peak outflow. The 1/2 PMF would overtop the stone masonry dam. Structural stability analysis, as well as visual observation, indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, the spillway is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

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Therefore, it is recommended that within 3 months after receipt of this report by the Owner, a detailed hydrologic and hydraulic analysis be started to better assess spillway capacity. Within 18 months after receipt of this report by the Owner, any appropriate

remedial work should be completed. The detailed analysis and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

In the meantime, the Owner should immediately institute a program to visually inspect the dam and its appurtenances at least once a month. Also, within 3 months after receipt of this report the Owner should complete development of a surveillance program for use during periods of heavy runoff and of an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

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Because of other deficiencies, the following additional investigations should be started within 3 months after receipt of this report by the Owner. The investigations should be performed by a qualified, registered professional engineer.

1) Investigate the leakage through the joints in the stone masonry dam.

2) Investigate the accumulation of sediment against the upstream face of the dam with particular concern that the low level outlet is not plugged by the sediment.

Any remedial work deemed necessary as a result of these investigations should be completed within 18 months after receipt of this report by the Owner. A qualified, registered professional engineer should design and observe the construction of any necessary remedial work.

The following remedial work should be completed by the Owner within 12 months after his receipt of this report. Where engineering assistance is indicated, the Owner should engage a qualified, registered professional engineer. Assistance by such an engineer may also be useful for some of the other work.

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1) Clean the logs and debris off of the contact between the downstream face of the dam and the left abutment and have that area inspected by an engineer.

2) Dewater the gate chamber and outlet pipe downstream of the gate and have those areas and the gate mechanism inspected by an engineer.

3) Reach agreement with the court and NYS-DEC to allow the outlet pipe gate to be opened for regular exercising and when required to allow maintenance of the dam and appurtenances.

4) Remove trees and brush and their root systems within a radius of 25 feet of each end of the dam and in a zone 25 feet wide downstream from the dam. Continue to keep these same areas clear of trees and brush by cutting and cleanup at least annually.

5) Contingent on the results of the detailed hydrologic and hydraulic analysis and the detailed stability analysis, repair the deterioration of the concrete cap and stone masonry along the spillway crest.

6) Relocate the outlet pipe control gate to the upstream side of the dam.

7) Develop and implement effective routine operation and maintenance procedures for the dam and its appurtenances. The outlet pipe gate should be exercised regularly.

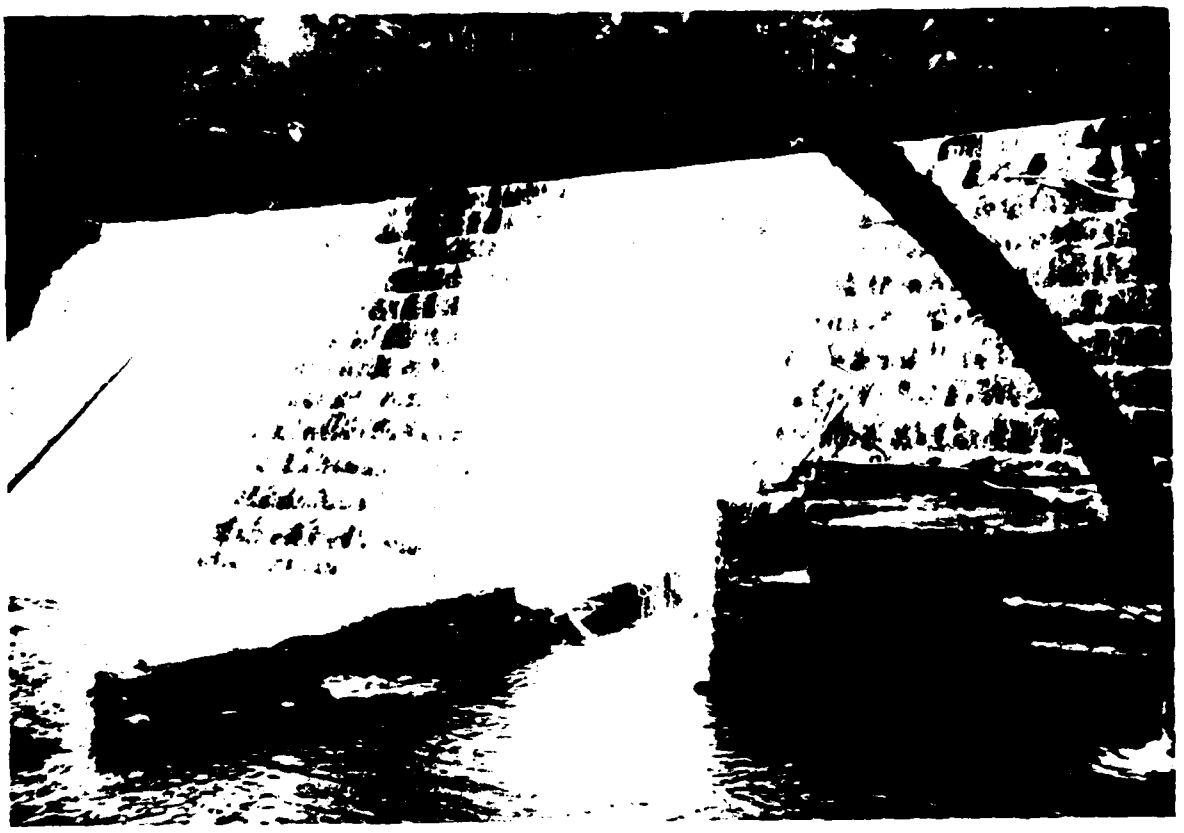
8) Institute a program of comprehensive technical inspection of the dam and its appurtenances by an engineer on a periodic basis of at least once every two years.

Kenneth J. Male
President
C. T. Male Associates, P.C.
NY PE 25004

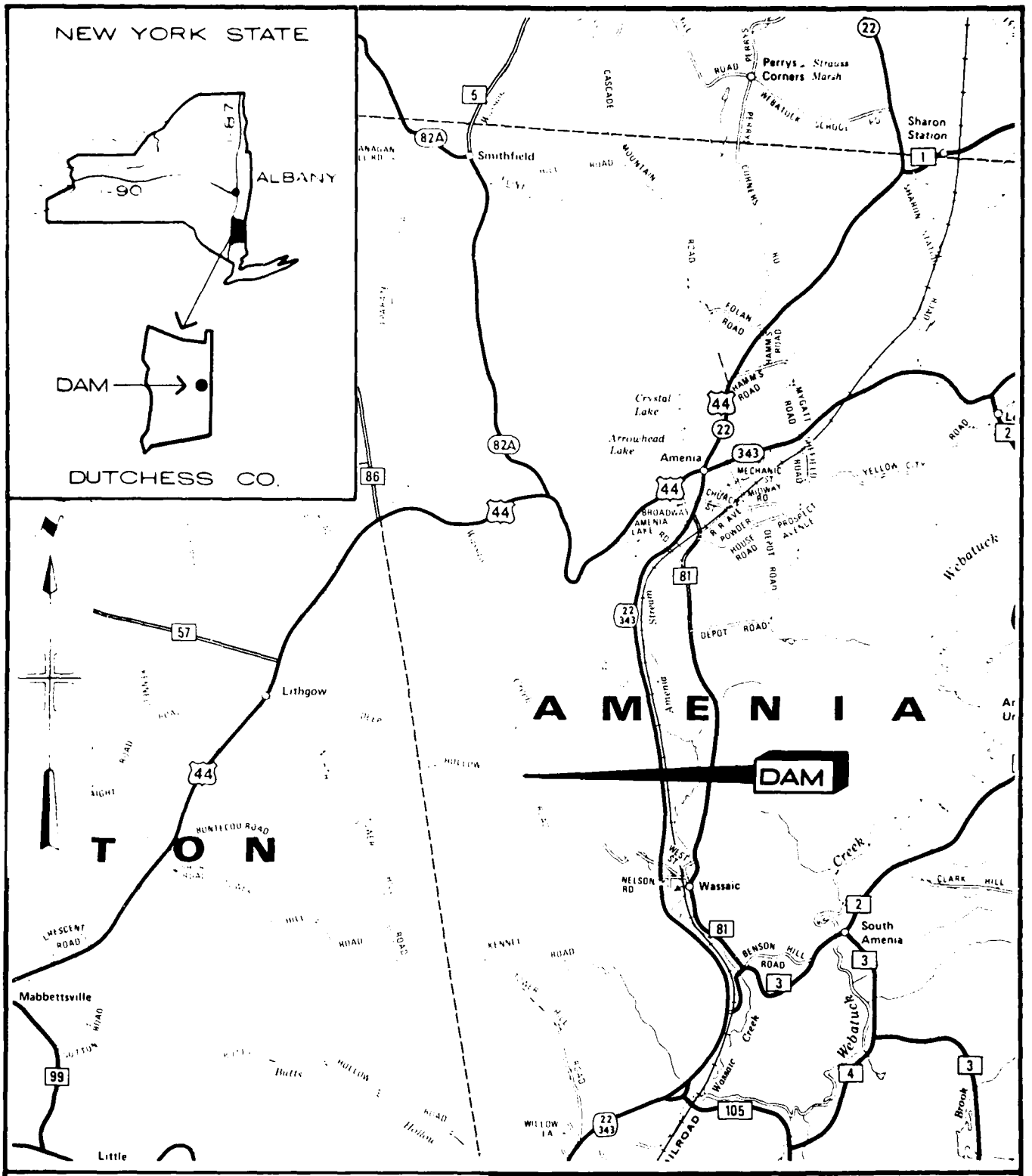
Approved by:

Col. W. M. Smith, Jr.
New York District Engineer
Corps of Engineers

Date: 31 Aug 81



Overview Photo - Thornes Dam - 5/5/81



SCALE OF MILES

0 1 2

BASE MAP: DUTCHESS CO.
HIGHWAY MAP - 1974

PROJECT NO. 58.01.013/80.853

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THORNES DAM
VICINITY MAP

TOWN OF AMENIA	DUTCHESS CO., NY
SCALE: 1" = 1 MI. APPROX.	DATE: JANUARY 1981

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

NAME OF DAM: THORNES DAM, ID NO. NY 00793

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority

The National Dam Inspection Act, Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New York District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within New York State. C. T. Male Associates, P.C., has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to C. T. Male Associates, P.C., under a letter from Michael A. Jezior, LTC, Corps of Engineers. Contract No. DACW51-81-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purpose of the inspection program is to perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public, and thus permit correction in a timely manner by non-Federal interests.

1.2 DESCRIPTION OF PROJECT

a. Location

The dam is located on the Wassaic Creek about 1.5 miles northwest of the hamlet of Wassaic. The dam at its maximum section is at Latitude 41 degrees - 49.0 minutes North, Longitude 73 degrees - 35.0 minutes West.

Access to the dam is from State Route 44 to the north, then south via a private dirt road along the Wassaic Creek about 2 miles to the dam.

The official name of the dam is Thornes Dam. The impoundment has no name.

b. Description of Dam and Appurtenances

Thornes Dam is a stone masonry gravity structure with a crest that is slightly convex upstream. The dam has an overflow spillway which is just a lower portion of the majority of the dam crest. The dam is about 227 feet long (including the spillway) by about 38 feet high. The upstream face of the dam is vertical and appears to be covered, at least in part, with a coating of mortar. The downstream face of the dam is stepped, each step averaging 18 inches wide by 30 inches high, for an average downstream slope of 0.6H:1V. The top of the dam is covered with a concrete cap and is about 4 feet wide.

The overflow section or spillway is about 147 feet long and its crest is about 2.5 feet lower than the top of the dam. The crest of the spillway is covered by a concrete cap about 4 feet wide. Water discharging over the spillway cascades down the stepped-stone downstream face of the dam into the natural stream channel at the downstream toe.

Just to the left of the center of the dam, from about Sta 0+80 to 1+00, there is a stone masonry gate chamber at the downstream toe. This chamber contains a slide gate or valve in the 48-inch diameter cast iron outlet pipe. The gate is operated by a valve wrench inserted through an access manhole in the top of the chamber onto an operating nut. The outlet pipe downstream from the gate is encased in stone masonry to the left of the gate chamber.

c. Size Classification

In accordance with Recommended Guidelines (Reference 1), Thornes Dam is classified as "small" in size because its height is about 38 feet (within the 25 to 40-foot range). The maximum storage capacity at top of dam is 44 acre-feet.

d. Hazard Classification

In accordance with Recommended Guidelines (Reference 1), Thornes Dam is classified as having a "high" hazard potential. This is because it is judged that failure of the dam would significantly increase flows downstream which could cause loss of more than a few human lives and appreciable property damage. Downstream development that could be damaged or destroyed by a dam failure includes the hamlet of Wassaic, with many dwellings, through the middle of which the Wassaic Creek runs about 1.5 miles downstream of the dam (vertical drop from the dam to the hamlet is about 165 feet).

e. Ownership

Presently the dam and reservoir are owned by:

Turkey Hollow, Inc.
Box AC
Millbrook, NY 12545

Attn: Jesse Bontecou, President
(914) 868-1975

f. Operator

There is no one designated by the Owner to be responsible for day-to-day operation of the dam. However, on a part-time basis, operation of the facility is undertaken by:

Michael M. Bontecou
Bontecou Road
Millbrook, NY 12545

(914) 677-5245

g. Purpose of Dam

The dam was originally constructed to impound water for recreational use. The impoundment is still used for this purpose, including fishing and canoeing.

h. Design and Construction History

It is believed that the dam was constructed around 1905 for the Thornes family. No data concerning the original design and construction could be found. The designer and construction contractor are unknown.

There is no knowledge or record of any reconstruction, modification, major repair, or maintenance of the dam.

i. Normal Operating Procedures

The dam site is visited several times per week on a random basis by the Operator, who casually views the dam at those times.

The water level is normally at about the spillway crest, which has no provisions for flashboards. The outlet gate, which is manually operated by using a valve wrench on an operating nut, is normally shut.

1.3 PERTINENT DATA

a. Drainage Area	(square miles)	23.91

b. Discharge at Dam Site (cfs)

Spillway (W.S. at top of dam)	1,790
Outlet Pipe (normally closed - estimated potential w/W.S. at spillway crest)	300
Maximum Known Flood (estimated at 2.1 feet over spillway crest during hurricane in 1950's)	1,380

c. Elevation (feet - NGVD)

All elevations are estimated from USGS topographic mapping (see Appendix C-5) and are in feet above mean sea level NGVD (National Geodetic Vertical Datum of 1929).

Top of Dam (average)	617.5
Design High Water	Unknown
Spillway Crest (nominal or design)	615
Entrance Invert of Outlet Pipe	588 ±

d. Reservoir Length (feet) - at spillway crest 1400 ±

e. Reservoir Surface Area (acres)

Top of Dam	4.4 ±
Spillway Crest	3.0

f. Reservoir Storage (acre-feet)

Top of Dam	44
Spillway Crest	35

g. Dam

Type - Stone masonry gravity section.
Length - About 227 feet including spillway.
Height - About 38 feet.
Top Width - About 4 feet.
Side Slopes - Upstream - Vertical.
Downstream - Stepped-stone face averaging 0.6H:1V, each step about 18 inches wide by 30 inches high.
Zoning - Not applicable.
Impervious Core - Not applicable.
Cutoff - Unknown.
Grout Curtain - Unknown.

725 h. Spillway

Type - Overflow section in center of dam, no flashboards.
Length of Weir - About 147 feet.
Upstream Channel - Reservoir immediately upstream of crest. About 17 feet deep to top of silt at face of dam.
Downstream Channel - Downstream stepped-stone face of dam into natural stream channel at toe.

i. Outlet Pipe
Size - 48-inch diameter.
Description - Cast iron pipe through dam at toe. Can apparently act as low level drain.
Control - Horizontally moving gate in pipe about 12 feet from d/s end. Operated using a valve wrench on an operating nut located directly under access manhole in stone masonry chamber at toe of spillway.

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SECTION 2

ENGINEERING DATA

2.1 DESIGN DATA

a. Geology

No geologic data was available in the engineering data and records found for this dam. The following information was obtained from current geologic maps (References 29 and 30) as well as from the site visit.

Thornes Dam is located within the Taconic Section of the New England Province. Bedrock in the vicinity of the dam consists of phyllite, schist, and metagraywacke, which are of Middle Ordovician age. The rocks in the vicinity of the dam were intensely folded and faulted during the Taconic Orogeny. However, no major faults have been mapped within the immediate vicinity of the dam. There are no surficial geologic maps or reports available concerning the overburden soils in this area.

The phyllite bedrock exposed in the abutments is foliated and strikes approximately parallel with the axis of the dam, dipping about 40° in the upstream direction.

b. Subsurface Investigations

No records of subsurface investigations for this site are available.

c. Dam and Appurtenances

It is believed that the dam was designed around 1905 for the Thornes Family. The designer of the dam is not known. No data concerning the original design could be found.

2.2 CONSTRUCTION HISTORY

a. Initial Construction

It is believed that the dam was constructed around 1905. The original contractor for the dam is unknown. No records concerning the actual construction of the dam and appurtenances are known to exist.

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b. Modifications, Repairs, and Maintenance

There is no knowledge or record of any reconstruction, modification, major repair, or maintenance of the dam.

c. Pending Remedial Work

The Owner presently has an application pending with NYS-DEC to do concrete repair work on the spillway crest.

2.3 OPERATION RECORD

a. Inspections

There is no known record of inspection of the dam by the Owner.

The only records available concerning the dam consisted of correspondence requesting an inspection of the dam, the subsequent inspection report, and a follow-up letter on the inspection (see Appendix F3). The inspection report by the NYS-DEC, dated October 18, 1978 (see Appendix F3-5), indicated that there was some "surface deterioration" of the dam and that "no defects (were) observed beyond normal maintenance."

A letter from the Corps of Engineers, dated February 23, 1978 (see Appendix F3-3), indicated that the dam received a cursory inspection by the State in 1973, but no records concerning this inspection could be found.

b. Performance Observations, Water Levels, and Discharges

Other than the observations on the condition of the dam in the one inspection report found (see Appendix F3-5), there are no other known records of performance observations.

There are no known records of routine water levels and discharges at the dam.

c. Past Floods and Previous Failures

There are no known previous failures of the dam.

According to the Operator, a hurricane in the 1950's caused the water level to rise to within about 1.5 feet below the porch floor of the lodge located on the left shore of the reservoir. Based on field measurements, this corresponds to about 2.1 feet above the spillway crest and about 0.4 of a foot below the top of dam. This is the highest known water level at the dam and it caused no known damage to the dam. The Operator's family has home movies of the flood event, but these were not reviewed as part of this inspection.

2.4 EVALUATION

a. Availability

As listed on Appendix F1, the limited engineering data and records concerning the dam are available from the files of the

Dam Safety Section of the NYS-DEC. Copies of all data found are included in chronological order in Appendix F3. Appendix F2, Checklist for General Engineering Data and Interview with Dam Owner, also contains some pertinent engineering information.

b. Adequacy

Available data consisted of correspondence concerning a dam inspection and the inspection report itself, together with comments by the Operator of the dam. Such data as design/construction drawings, record drawings, construction specifications, design calculations, data on foundation and embankment soils, and operation and performance data are not available. The lack of such in-depth engineering data does not permit a comprehensive review. Therefore, the available data was not adequate by itself to permit an assessment of the dam.

c. Validity

The limited data available appears to be valid.

SECTION 3

VISUAL INSPECTION

3.1 FINDINGS

a. General

Thornes Dam was inspected on May 5, 1981. The inspection party (see Appendix B-1) was accompanied by Mr. Michael Bontecou, the part-time Operator, who represented the Owner. The weather was warm and sunny. The water surface was at about EL 614.6, or about 6 inches over the spillway crest at its extreme low point. The Visual Inspection Checklist is included as Appendix B, while selected photos taken during the inspection are included in Appendix A and as the Overivew Photo at the beginning of this report. Appendix A-1 is a photo index map.

b. Dam

There is no evidence of any major structural failure of the dam.

Abutments - Phyllite bedrock is exposed at the contacts between the downstream face of the dam and both abutments. No seepage was observed at the abutments. There is a thin soil cover on both abutments and some trees are growing on the abutments (see Photos A-4A and A-4B). There are logs and debris on the contact between the downstream face of the dam and the left abutment (see Photo A-3B).

Foundation - The bottom of the channel immediately downstream of the dam is covered with boulders, gravel, sand, and silt. It is not possible to determine on the basis of the visual inspection alone whether the dam is founded on bedrock. However, the exposures of bedrock on the abutments indicate that the dam is probably founded on bedrock. Because of the tailwater at the downstream toe of the dam it is not possible to determine on the basis of the visual inspection alone whether any seepage is taking place through the foundation of the dam.

Stone Masonry Dam - Water is leaking at an estimated rate of 15 gallons per minute from the joints in the stone masonry between the left abutment and Station 0+60, and at an estimated rate of 10 gallons per minute between Station 1+85 and the right abutment. Between Stations 0+60 and 1+85 water is flowing over the dam and it is not possible on the basis of the visual inspection alone to determine whether any water is leaking through the joints.

The entire stone masonry dam (see Overview Photo and Photo A-3A) is only in fair condition. The stone masonry of the stepped downstream face shows signs of deterioration due to water action and the weather. Stones are missing and broken; mortar joints are loose with mortar missing in spots; and there is seepage through the joints as mentioned previously (see Photos A-5A, A-5B, and A-6B). The stone masonry in the area of the dam under the spillway section, downstream of the crest, generally appeared to be in somewhat better shape then the downstream areas of the dam near the abutments.

The concrete cap of the dam is weathered and only in fair condition (see Photos A-5B and A-6A). The mortar coating is cracked and spalled off in places, and there is some efflorescence. The upstream face of the dam also has a mortar coating which also has cracked and spalled off in various places.

c. Appurtenant Structures

1) Gate Chamber and Outlet Pipe

The gate chamber is a stone masonry chamber, with an access manhole on top, located at the toe of the dam downstream of the left side of the spillway section (see Photo A-7B). The chamber appears to be in good condition, although it is full of water. The whole structure is submerged by high spillway flows. There is minor cracking and deterioration of the stones and mortar at the edges and corners of the chamber.

Inside the chamber, directly below the manhole opening, there is an operating nut for the slide gate control mechanism. By using a valve wrench on the operating nut the slide gate can be opened or closed. The condition of the control mechanism was unobservable due to the water in the chamber. The Operator says that the gate works and that it was last used in 1980. The gate itself is rusty and leaks when closed (see Photo A-8B).

The outlet from the dam is a 48-inch cast iron pipe (see Photo A-8A). The inside of the pipe is rusty but no significant scaling of the iron has occurred. A portion of the pipe about 6 feet long by 2.5 feet wide is missing from the right side, near the gate end (see Photo A-8B).

The outlet pipe control gate is located on the downstream side of the dam. Its location there is undesirable because it causes the outlet pipe through the dam to be under pressure when the gate is closed.

2) Spillway

The spillway is an overflow section in the center portion of the dam (see Photos A-2A and A-2B). The spillway crest averages about 2.5 feet lower than the non-overflow end portions

of the dam (see Photo A-7A). The concrete cap and stone masonry along the spillway crest is in poor condition. The concrete cap is completely missing in some places, while in other places it is cracked and broken up (see Photos A-6A and A-7A). The stone masonry at the spillway crest is missing to a depth of about 0.9 of a foot below the nominal or design crest elevation near the right side of the spillway (see Photo A-2A). Elsewhere along the spillway crest, and in the overflow portion of the dam below, the stone masonry is weathered and in fair condition. Stones are broken, loose, and missing. The mortar joints are also deteriorated with mortar missing in some places.

d. Reservoir Area

There is sediment against the upstream face of the dam up to an elevation which is about 10 feet higher than the invert of the downstream end of the low level outlet pipe (and about 17 feet below the spillway crest). The Owner's representative reports that a considerable amount of sediment is discharged through the low level outlet when the gate is opened.

The reservoir slopes are moderately steep and heavily tree-covered, with numerous bedrock exposures (see Photo A-9B). There are no signs of significant stability problems in the perimeter slopes.

e. Downstream Channel

The downstream channel consists of the natural channel of Wassaic Creek. Below the spillway, at the toe of the dam, the channel is about 150 feet wide (about the width of the spillway). Some debris (such as logs), the gate chamber, and an old stone masonry wall (purpose unknown) are located in the channel at the toe (see Photo A-7B). Further downstream the channel narrows to about 40 feet. There is substantial tree growth and exposed bedrock along the channel downstream from the dam (see Photo A-9A).

3.2 EVALUATION

Leakage taking place between the joints in the stone masonry of the dam is an indication of a general structural deterioration of the dam. The deteriorated condition of the stone and mortar joints is therefore of concern.

The concrete cap and stone masonry at the spillway crest is in poor condition due to water action and weathering.

67 Trees growing in the thin soil over the bedrock on the abutments could cause a deterioration of the foundation bedrock and the buried section of the stone masonry dam itself due to the wedging action of the roots.

Sediment which accumulates in the reservoir behind the dam could result in plugging of the low level outlet. Also, the sediment puts an additional load on the dam structure.

Logs and debris on the contact between the downstream face of the dam and left abutment make it difficult to monitor that area adequately for signs of seepage or other problems.

The gate chamber should be dewatered so that the interior of the chamber and the equipment inside can be inspected.

The location of the outlet pipe control gate on the downstream side of the dam is undesirable because it causes the outlet pipe through the dam to be under pressure when it is closed.

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SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 OPERATION PROCEDURES

There are no written operation procedures for the dam.

The pond impounded by Thornes Dam is used for recreational purposes. Normally the outlet gate on the outlet pipe is closed and water is allowed to flow uncontrolled over the spillway crest. There are no provisions for flashboards on the spillway.

At the time of inspection the reservoir level was about 6 inches higher than the extreme low point of the spillway crest, with the spillway discharge estimated to be 20 cfs.

4.2 MAINTENANCE OF DAM AND OPERATING FACILITIES

There are no maintenance procedures for the dam.

The dam site is visited several times per week on a random basis by the Operator, who casually views the dam at those times.

There is no regular or periodic operation of the outlet gate, which is manually operated by putting a valve wrench on an operating nut inside the access manhole. About 20 years ago the gate was operated to drain the pond for cleaning. The gate was last operated in October 1980 to lower the water level so that repair work on the spillway crest could be done. According to the Operator, the gate was partially opened, but vandals opened the gate fully, draining the pond in about six hours. This caused high flows and heavy sediment downstream. The sediment caused fish kill, complaints were lodged by people downstream, and the NYS-DEC started court action against the Owner. The gate is presently operable, and the Operator indicates that he would like to regularly exercise the gate, but the NYS-DEC has a court order which requires the Owner to keep the gate shut. Reportedly, it took about 24 hours for the pond to refill after the gate was shut in 1980.

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4.3 EMERGENCY ACTION PLAN AND WARNING SYSTEM

There is no emergency action plan and warning system for the dam.

4.4 EVALUATION

Maintenance of the dam and appurtenances is unsatisfactory. Deterioration of the stone masonry and concrete is occurring. Effective operation and maintenance procedures need to be developed and implemented by the Owner in order to avoid the continued deterioration of the dam.

The Owner should develop an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

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SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 DRAINAGE AREA CHARACTERISTICS

Thornes Dam and its impoundment are located on the Wassaic Creek in southeastern New York. About 3.5 miles downstream of the dam the Wassaic Creek joins the Tenmile River. The Tenmile River flows south and discharges into the Housatonic River.

The total drainage area at the dam is 23.91 square miles, of which only about 0.005 square miles (3.0 acres), or less than one-tenth of a percent, is actual reservoir surface at the spillway crest. The topography of the drainage area is hilly and is characterized by alternating flat areas and slopes of up to 25%. Elevations in the drainage area vary from EL 615 to EL 1409. (See Appendices C-5 and C-6.)

5.2 ANALYSIS CRITERIA

The U.S. Army Corps of Engineers Hydrologic Engineering Center's Program HEC-1 DB (Reference 3) was used to develop the test flood hydrology and perform the reservoir routing.

The purpose of this analysis was to evaluate the dam and spillway with respect to their surcharge storage and spillway capacity. Accordingly, it was assumed that the water surface was at the spillway crest at the start of the flood routing. In addition, the outlet pipe was assumed to be closed, as it is normally. The outlet pipe gate could not be opened during a flood anyway because flow over the spillway would prevent access to the gate operating nut in the gate chamber at the toe of the spillway.

A constant base flow of 2 cfs per square mile was chosen to represent average conditions in the drainage area and was inputted into the program for all subareas.

The index PMP (probable maximum precipitation) inputted to the HEC-1 DB program was 21 inches for a 24-hour duration all-season storm over a 200-square-mile basin, according to HMR 33 (Reference 4). Maximum 6-hour, 12-hour, 24-hour, and 48-hour precipitation for the actual size of the drainage area (same for 10 square miles or less) were inputted to the program as percentages of the index PMP in accordance with HMR 33. A storm reduction coefficient was then applied internally by the program in order to transpose or center the storm over the actual total drainage area. Thus, the corrected 48-hour PMP for the actual total drainage area became 23.1 inches. All rainfall was distributed using the Standard Project Storm arrangement embedded in the program.

35 Appendix C-7 summarizes the subarea, loss rate, and unit hydrograph data inputted to the program. Only two subareas were used. Subarea 1 consists of all the drainage area around the reservoir, and Subarea 2 consists of just the reservoir surface. For the land in Subarea 1, loss rates were assumed to be 1.0 inch initially and a constant 0.1 inch per hour thereafter. Snyder unit hydrograph parameters were assumed for average conditions and a conservative standard lag time was computed. The program uses the inputted lag time and Snyder peaking coefficient to solve by iteration for approximate Clark coefficients, which are then used to calculate the runoff hydrograph.

For the reservoir surface making up Subarea 2, loss rates were set to zero so that rainfall would equal rainfall excess, or runoff. Assuming no delay in the rainfall/runoff response, a constant unit hydrograph for a rainfall duration equal to the HEC-1 DB calculation interval was developed per Appendix C-7 and inputted to the program.

The floods selected for analysis were the PMF (probable maximum flood) and 1/2 PMF. Floods as ratios of the PMF (e.g., 1/2 PMF) were taken as ratios of runoff, not of precipitation. Peak inflow for the PMF is about 30,800 cfs or 1,288 csm (cfs per square mile), and about 15,400 cfs (644 csm) for 1/2 PMF. Peak outflows for both flood events are not reduced by reservoir routing and are the same as peak inflows.

5.3 RESERVOIR CAPACITY

Storage capacity data for the reservoir was developed using USGS contour mapping (see Appendix C-5) and a bottom elevation of the pond estimated during the visual inspection. Area measurements inside contour elevations were obtained from the USGS mapping, a reservoir area of zero was assumed for the bottom of the pond (EL 580), and the capacity of the reservoir at various elevations was then computed by the HEC-1 DB program using the method of conic sections. A hand tabulation of the input and the computed results is on Appendix C-6.

At the spillway crest, EL 615, the reservoir has a capacity of about 35 acre-feet. At the top of dam, EL 617.5, the reservoir has a capacity of about 44 acre-feet. Surcharge storage between the spillway crest and top of dam amounts to 9 acre-feet, or less than 0.01 of an inch of runoff from the total 23.91-square-mile drainage area. Therefore the reservoir has essentially no capacity to attenuate peak inflow.

)461 ## 5.4 SPILLWAY CAPACITY

The dam has a 147-foot-long overflow spillway in the center of the dam. The top of the dam averages about 2.5 feet higher than the spillway crest.

The discharge capacity for the spillway was computed assuming critical flow over an ideal broad-crested weir. Since the spillway

does have a crest width of about 4 feet, the broad-crested weir approximation is considered adequate for this analysis. Reduction in discharge capacity due to abutment contractions was neglected. The spillway discharge computations are presented on Appendix C-8. With water 2.5 feet over the spillway crest (i.e., water level at top of dam) the spillway discharges about 1,790 cfs.

Total discharge from the dam consists of flow from the spillway plus flow over the dam for the overtopping condition. As discussed previously in Section 5.2, the outlet pipe was assumed closed, as it is normally. Flow over the dam was modeled as an ideal broad-crested weir. The weir parameters for the spillway and top of dam were inputted to the HEC-1 DB program which did the discharge calculations during the flood routing. A hand tabulation of the input and computed results is on Appendix C-8.

With the reservoir level at top of dam, EL 617.5, the total discharge from the dam is the capacity of just the spillway, or about 1,790 cfs.

5.5 FLOODS OF RECORD

As discussed in Section 2.3c, the flood of record, due to a hurricane in the 1950's, is estimated to have been 2.1 feet over the spillway crest Using the spillway capacity data developed in Section 5.4, the corresponding flood discharge is estimated to have been 1,380 cfs (58 csm), or only about 4% of the PMF peak outflow predicted.

5.6 OVERTOPPING POTENTIAL

The results of the overtopping analysis using the HEC-1 DB program are summarized in Table 5.1. The overtopping analysis computer input and output for the PMF and 1/2 PMF are included starting on Appendix C-9.

398 As noted from Table 5.1, the PMF overtops the dam by about 10.8 feet maximum with duration of overtopping of about 13.0 hours. 1/2 PMF also overtops the dam but by about 6.2 feet maximum with duration of overtopping of about 10.3 hours. Peak inflows are 30,800 cfs for the PMF and 15,400 cfs for 1/2 PMF. For both floods peak outflow is not reduced by reservoir routing and is the same as peak inflow. Time to maximum stage, or the time from the start of the 48-hour storm to peak outflow, is about 44 hours for both PMF and 1/2 PMF. The peak portion of the inflow and outflow hydrographs for the PMF and 1/2 PMF are shown by the computer plots on Appendices C-15 and C-16. Total project discharge capacity at the top of dam is due to the spillway (outlet pipe closed) and is about 1,790 cfs, or only about 6% of the PMF peak outflow and about 12% of the 1/2 PMF peak outflow.

TABLE 5.1

THORNES DAM

OVERTOPPING ANALYSIS

CONDITIONS

Total Drainage Area = 23.91 square miles
Start Routing at Spillway Crest EL 615
Top of Dam EL 617.5
Total Project Discharge Capacity at Top of Dam = 1,790 cfs ± due to Spillway. Outlet pipe assumed closed.
Some values rounded from computed results

	PMF	1/2 PMF [a]
INFLOW		
48-hour Rainfall (inches)	23.1	13.4 [b]
48-hour Rainfall Excess (inches) [c]	19.4	9.7 [d]
Peak Inflow (cfs)	30,800	15,400
Peak Inflow (csm)	1,288	644
OUTFLOW		
Peak Outflow (cfs)	30,800	15,400
Peak Outflow (csm)	1,288	644
Time to Peak Outflow (hours)	44.2	44.2
Maximum Storage (acre-feet)	111	79
Max W.S. Elevation (feet-NGVD)	628.3	623.7
Minimum Freeboard (feet)	overtopped	overtopped
Maximum Depth over Dam (feet)	10.8	6.2
Duration of Overtopping (hours)	13.0	10.3

(a) One-half of PMF total runoff, including base flow. For PMF base flow = 2 cfs per square mile = 48 cfs ±.
(b) Approximation assuming total losses are the same as for the PMF.
(c) Rainfall Excess = Rainfall for the Reservoir Surface. For the rest of the drainage area, losses are assumed to be 1.0 inch initially and 0.1 inch per hour thereafter.
(d) Equal to one-half of PMF value.

5.7 EVALUATION

Maximum spillway discharge capacity (outlet pipe closed) is only about 6% of the PMF peak outflow. The 1/2 PMF would overtop the stone masonry dam. Structural stability analysis, as well as visual observation, indicates that overtopping due to 1/2 PM would probably cause failure of the dam. It is judged that failure due to overtopping would significantly increase the hazard to loss of life downstream from that which would exist just prior to failure. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, the spillway is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The following visual observations, which are discussed in detail in Section 3, are indicative of potential long-term stability problems at Thornes Dam:

1) Leakage through the joints in the stone masonry dam.
2) Deterioration of the concrete cap and stone masonry along the spillway crest.
3) Trees growing on the abutments.

b. Design and Construction Data

No records of design or construction data are available for this dam.

c. Operating Records

No operating records were found which would adversely affect the stability of the dam.

The sediment which has accumulated against the upstream face of the dam (to a depth of about 10 feet above the invert of the outlet pipe or about 17 feet below the spillway crest, see Section 3.1d) puts an additional load on the dam structure.

d. Post-Construction Changes

There have been no known post-construction changes at this dam.

e. Seismic Stability

This dam is in Seismic Zone 1. According to the Recommended Guidelines (Reference 1) a seismic stability analysis is not required.

6.2 STABILITY ANALYSIS

The dam is a stone masonry gravity structure, with a slight arch upstream, about 227 feet long by about 38 feet high from stream bed to top of dam. An independent structural stability analysis was performed on a representative section of the overflow portion of the dam. The cross section for analysis was chosen at about the center of the dam where its unsupported height is a maximum at

about 35.5 feet. The cross section geometry is based on limited measurement and observation during the visual inspection. The following loading cases were analyzed:

Case 1 - Normal pool at spillway crest, normal tailwater estimated at about invert of outlet pipe or 8.5 feet deep, full headwater and tailwater uplift, silt load starting 17 feet below spillway crest based on measurement.

Case 2 - Normal pool at spillway crest, ice load of 5 kips per linear foot for ice 1.0 foot thick, remaining conditions same as Case 1.

Case 3 - Half PMF pool at EL 623.7 or 8.7 feet above spillway crest, flood tailwater estimated at 10 feet more than normal or 17 feet below spillway crest, remaining conditions same as Case 1.

Case 4 - Full PMF pool at EL 628.3 or 13.3 feet above spillway crest, flood tailwater estimated at 15 feet more than normal or 12 feet below spillway crest, remaining conditions same as Case 3.

The results of the stability analysis are summarized in Table 6.1. The computations are included as Appendix D.

For all loading cases analyzed, minimum satisfactory overturning stability is considered to be a factor of safety of 1.5 with the resultant passing through the middle third of the base. For sliding stability, because of the high loading conditions and the conservative assumptions made about foundation material properties, a minimum satisfactory factor of safety of 2.0 is considered appropriate for all the loading cases analyzed, rather than the customary 3.0. Both overturning and sliding stability must be satisfactory in order for stability of the section to be satisfactory.

As noted from Table 6.1, the overflow section is unstable for all loading conditions. Included in the unstable rating are the normal spring-summer-fall condition (Case 1) and the winter ice load condition (Case 2).

Additional analysis indicates that if the silt load behind the dam is completely neglected, the overflow section is still unstable with respect to sliding and still has unsatisfactory stability with respect to overturning (see footnote (d) on Table 6.1 and calculations on Appendix D-3).

For cases 3 and 4, the 1/2 PMF and PMF conditions, it should be noted that the full weight of the flowing water on the face of the overflow section was taken into account as a resisting force.

TABLE 6.1

THORNES DAM

STABILITY ANALYSIS OF OVERFLOW SECTION

CASE	OVERTURNING			SLIDING FACTOR OF SAFETY (c)	
	FACTOR OF SAFETY (a)		LOCATION OF RESULTANT (b)		
1- Normal Pool	1.31[d]	unsatisfactory	0.27 b	0.77[d]	unstable
2- Normal Pool plus Ice Load	1.12	unsatisfactory	0.12 b	0.69	unstable
3- Half PMF Pool	1.03	unsatisfactory	0.03 b	0.61	unstable
4- Full PMF Pool	0.95	unstable	-0.07 b	0.57	unstable

(a) Overturning factor of safety is ratio of resisting moments to driving moments taken about the toe.

(b) Distance from toe to point where resultant passes through base, expressed in terms of base dimension "b". Middle third of base is 0.33b to 0.67b.

(c) Sliding factor of safety is ratio of resisting forces to driving forces taken along a horizontal failure plane.

(d) If silt load is completely neglected, overturning FS=1.35 unsatisfactory and sliding FS=0.87 unstable.

Considering the relatively steep face of the section and the high head and discharge for the 1/2 PMF and PMF conditions, it is probable that the flowing water would exert little to no pressure - or even negative pressure - on the face of the section. Therefore, actual stability of the overflow section under such flood conditions might be even more unsatisfactory than presently indicated.

In view of the apparent instability of the overflow section, it is recommended that a detailed structural stability investigation of the dam be conducted to better assess its stability under all loading conditions. This should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dam. The investigation should determine what modifications to the dam, if any, are necessary to achieve satisfactory stability.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Visual inspection of Thornes Dam revealed the following deficiencies which affect the safety of the dam:

1) Leakage through joints in the stone masonry dam.

2) Sediment accumulating behind the dam above the elevation of the low level outlet pipe.

3) Deterioration of the concrete cap and stone masonry along the spillway crest.

4) The outlet pipe control gate is located on the downstream side of the dam.

5) Trees growing on the abutments.

Hydrologic and hydraulic analysis indicates that maximum spillway discharge capacity is only about 6% of the PMF peak outflow. The 1/2 PMF would overtop the stone masonry dam. Structural stability analysis, as well as visual observation, indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. It is judged that failure due to overtopping would significantly increase the hazard to loss of life downstream from that which would exist just prior to failure. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, the spillway is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

Structural stability analysis of the overflow or spillway section indicates that it is unstable for all loading conditions, including the normal spring-summer-fall condition and the winter ice load condition.

b. Adequacy of Information

Available information together with that gathered during the visual inspection, while considered adequate for this Phase I Inspection, is deficient in the following respects:

1) Logs and debris on the contact between the downstream face of the dam and the left abutment make it difficult to inspect that area adequately for signs of seepage or other problems.

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2) There are no data available on the material properties of the foundation under the dam or on structural details inside and under the dam. The lack of such data critically affects the structural stability analysis.

c. Need for Additional Investigations

The following detailed engineering investigations should be performed by a registered professional engineer qualified by training and experience in the design of dams:

1) Perform a detailed hydrologic and hydraulic analysis to better assess spillway adequacy. This should include an investigation of the site specific characteristics of the watershed.

2) Perform a detailed structural stability analysis of the dam to better assess its stability under all loading conditions. This should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dam.

3) Investigate the leakage through the joints in the stone masonry dam.

4) Investigate the accumulation of sediment against the upstream face of the dam with particular concern that the low level outlet is not plugged by the sediment.

d. Urgency

As recommended below in Section 7.2a, a program to visually inspect the dam at least once a month should be instituted immediately. As recommended below in Section 7.2b, development of a surveillance program and an emergency action plan should be completed within 3 months after receipt of this Phase I Inspection Report by the Owner. While the action plan is being developed, and within 3 months after receipt of this report by the Owner, the investigations recommended above in Section 7.1c should be started.

Any remedial work deemed necessary as a result of these investigations should be completed within 18 months after receipt of this report by the Owner. A qualified, registered professional engineer should design and observe the construction of any necessary remedial work.

Measures recommended below in Section 7.2c should be completed within 12 months after receipt of this report by the Owner.

7.2 RECOMMENDED MEASURES

The following work should be performed by the Owner. Where engineering assistance is indicated, the Owner should engage a registered engineer qualified by training and experience in the design of dams. Assistance by such an engineer may also be useful for some of the other work.

a. Complete Immediately

Institute a program to visually inspect - not just casually look at - the dam and its appurtenances at least once a month.

b. Complete Within 3 Months

Develop a surveillance program for use during and immediately after heavy rainfall or snowmelt, and also an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

c. Complete Within 12 Months

1) Clean the logs and debris off of the contact between the downstream face of the dam and the left abutment and have that area inspected by an engineer.

2) Dewater the gate chamber and outlet pipe downstream of the gate and have those areas and the gate mechanism inspected by an engineer.

3) Reach agreement with the court and NYS-DEC to allow the outlet pipe gate to be opened for regular exercising and when required to allow maintenance of the dam and appurtenances.

4) Remove trees and brush and their root systems within a radius of 25 feet of each end of the dam and in a zone 25 feet wide downstream from the dam. Continue to keep these same areas clear of trees and brush by cutting and cleanup at least annually.

5) Contingent on the results of the detailed hydrologic and hydraulic analysis and the detailed stability analysis, repair the deterioration of the concrete cap and stone masonry along the spillway crest.

6) Relocate the outlet pipe control gate to the upstream side of the dam.

3311 7) Develop and implement effective routine operation and maintenance procedures for the dam and its appurtenances. The outlet pipe gate should be exercised regularly.

8) Institute a program of comprehensive technical inspection of the dam and its appurtenances by an engineer on a periodic basis of at least once every two years.

b. Complete Within 18 Months

The following remedial work should be completed by the Owner. A qualified, registered professional engineer should design and observe the construction of the remedial work.

1) Appropriate modifications as a result of the detailed hydrologic and hydraulic analysis.

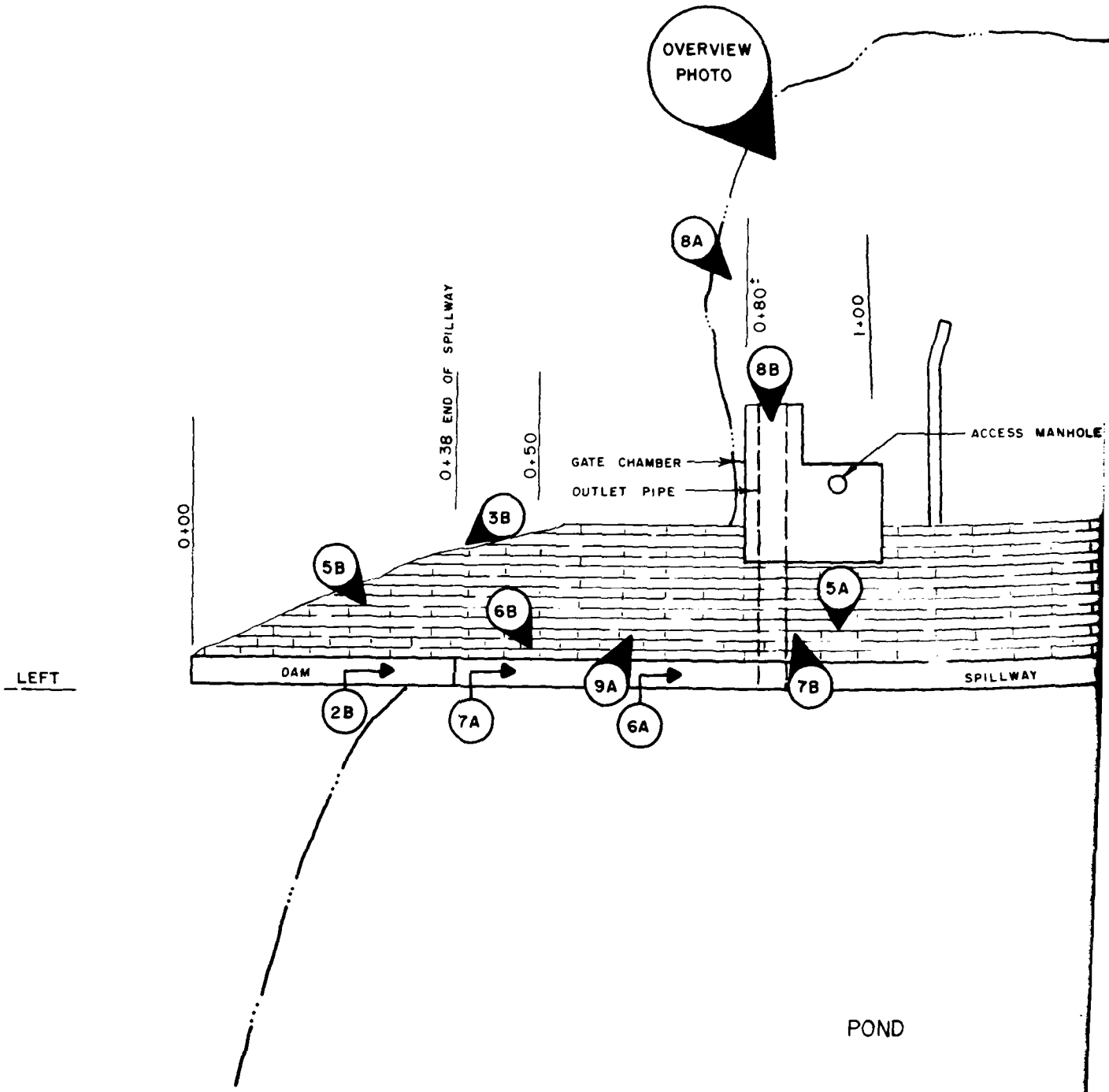
2) Appropriate modifications as a result of the detailed structural stability analysis of the stone masonry dam.

3) Appropriate modifications as a result of investigating the leakage through the joints in the stone masonry dam.

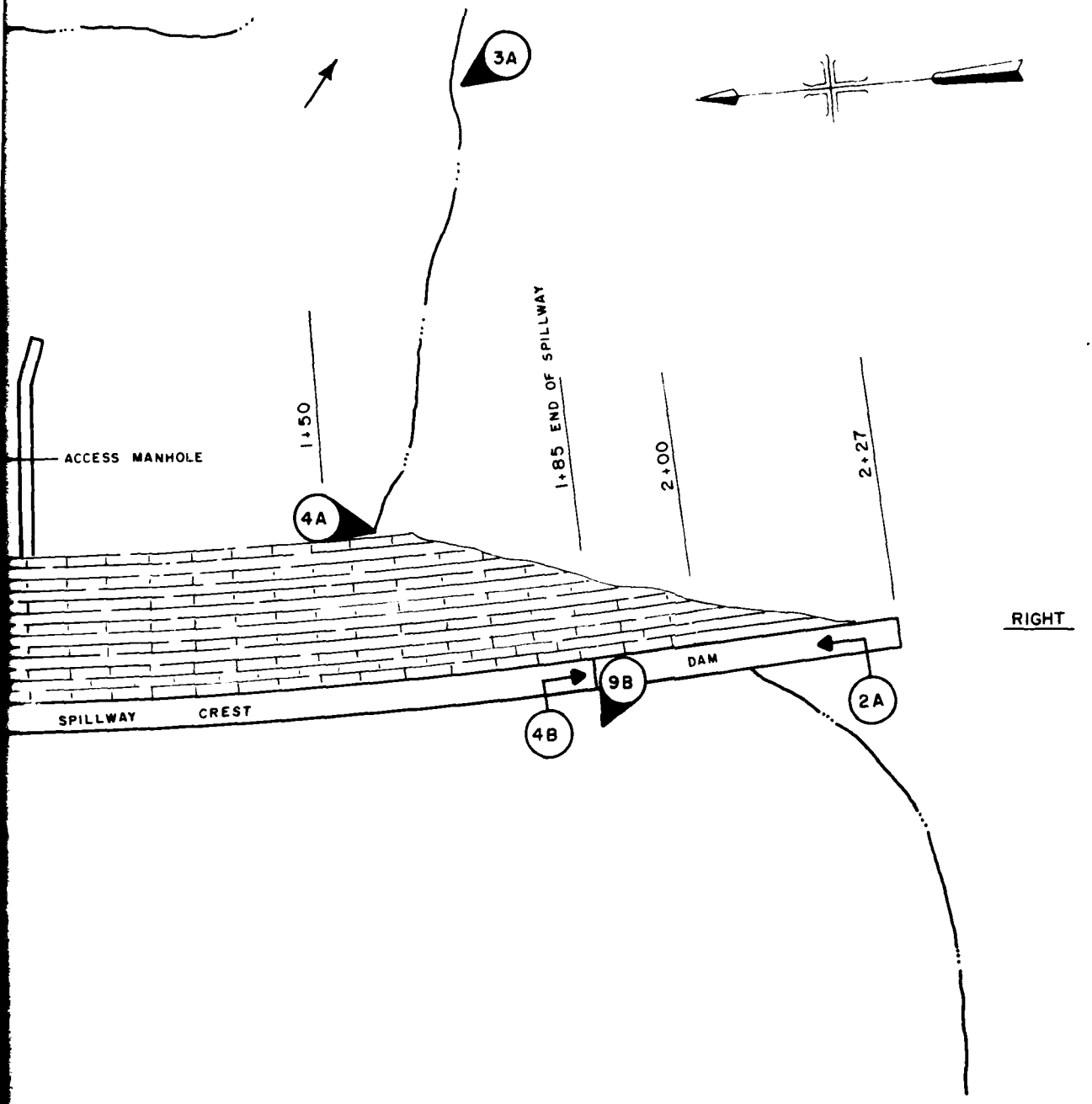
4) Appropriate modifications as a result of investigating the accumulation of sediment against the upstream face of the dam.

APPENDIX A

PHOTOGRAPHS


OVERVIEW PHOTO
8A
0+80±
1+00
8B
0+38 END OF SPILLWAY
0+50
0+00
ACCESS MANHOLE
GATE CHAMBER
OUTLET PIPE
3B
5B
6B
5A
LEFT
DAM
SPILLWAY
2B
7A
9A
6A
7B
POND

PROJECT



THORNES DAM
PHOTO INDEX MAP

TOWN OF AMENIA	DUTCHESS CO., N.Y.
SCALE NONE	DATE JULY 1981

C T MALE ASSOCIATES, P.C.
50 TROY ROAD SCHENECTADY N.Y. 12309
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS

2

PROJECT NO. 58-01-00013/80.853

A-1

DWG. NO. 81-22

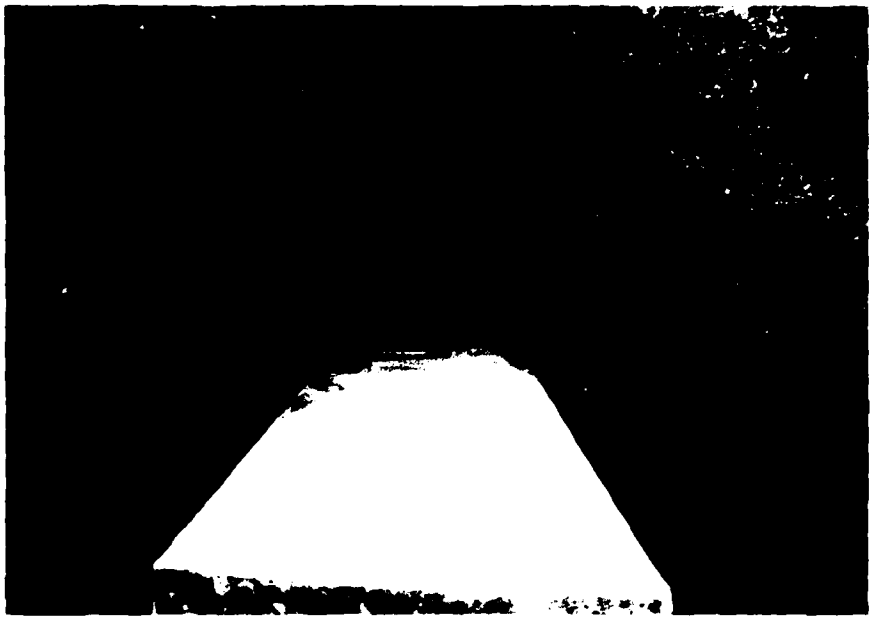
A-2A Left abutment, dam, and overflow section looking from right side of dam - 5/5/81

A-2B Right abutment, dam, and overflow section looking from left abutment - 5/5/81

A-3A Downstream side of dam looking from downstream of right abutment - 5/5/81

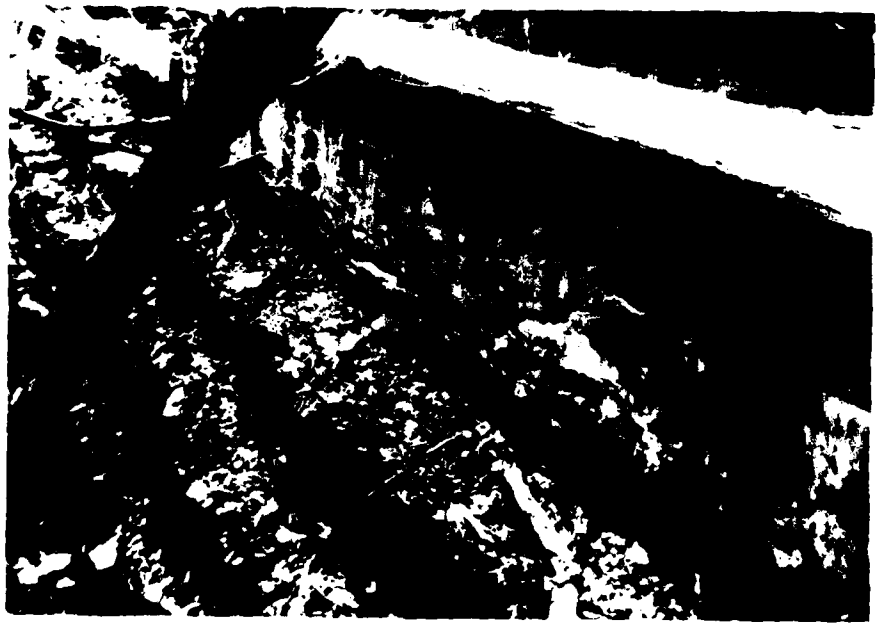
A-3B Contact between downstream face of dam and left abutment. Abutment appears to be bedrock, but is somewhat obscured by sections of logs which have been dumped along the contact 5/5/81

A-4A Contact between downstream face of dam and right abutment. Bedrock exposed at the contact and at water level on right bank of downstream channel. Trees growing on right abutment and on right bank of downstream channel - 5/5/81



A-4B Right abutment viewed from right end of overflow section. Trees growing on right abutment. No bedrock exposed in vicinity of end of dam at elevation of top of dam - 5/5/81

A-5A Typical view of stepped downstream face of dam. Note weathered condition of stones and missing mortar - 5/5/81



A-5B Downstream face of dam and concrete cap near left abutment. Note deteriorated condition of stone steps and concrete cap 5/5/81

A-6A Detail of cracking and spalling of concrete cap on overflow section of dam at about Sta 0+65 - 5/5/81

A-6B Close-up of dam on downstream side of spillway crest at Sta 0+50. Deteriorated condition of stone masonry and mortar is fairly typical of the whole dam - 5/5/81

A-7A Overflow spillway section looking toward right abutment. Note deteriorated condition of weir crest 5/5/81

A-7B Top of gate chamber looking from spillway crest. Note submerged access manhole in top of chamber and stone masonry wall in channel 5/5/81

A-8A Downstream end of outlet pipe - 5/5/81

A-8B Inside of outlet pipe looking upstream toward gate. Portion of pipe at upper left of photo near gate is missing - 5/5/81

A-9A Downstream channel looking from left side of top of dam 5/5/81

A-9B Reservoir looking upstream from right abutment. Lodge building is at right side of photo - 5/5/81

APPENDIX B

VISUAL INSPECTION CHECKLIST

PHASE I

VISUAL INSPECTION CHECKLIST

1. BASIC DATA

a. General

Name of Dam Thornes Dam

Fed. I.D.# NY00793 DEC Dam No. 741

River Basin HOUSATONIC RIVER BASIN

Location: Town [illegible] County DUTCHESS

Stream Name WASSAIC CREEK

Tributary of TENMILE RIVER

Latitude (N) 41° 47.0' Longitude (W) 73° 33.6'

Type of Dam STONE MASONRY GRAVITY DAM

Hazard Classification HIGH

Date(s) of Inspection May 5, 1981

Weather Conditions SUNNY & WARM

Reservoir Level at Time of Inspection EL 614.6 ±
(ABOUT 6" ABOVE EXTREME LOW POINT OF SPILLWAY)

b. Inspection Personnel (*Recorder) THOMAS BENNEDUM - CTM,
EDWIN VOSPERS JR* - CTM, RONALD C. HIRSCHFELD* - GEI

c. Persons Contacted (Including Title, Address & Phone No.)

MICHAEL M. BONTECOU, CONSIDERED OPERATOR
BONTECOU ROAD, MILLBROOK, NY 12545
(914) 677-5245

d. History
Date Constructed 1905± Date(s) Reconstructed N/A

Designer UNKNOWN

Constructed By UNKNOWN (FOR THORNES FAMILY)

Owner TURKEY HOLLOW, INC., BOX AC, MILLBROOK, NY 12545
ATTN: JESSE BONTECOU, PRESIDENT (914) 868-1975

1568 Name of Dam Thornes Dam Date May 5, 1981 2

2. EMBANKMENT This is a stone-masonry dam.

a. Characteristics

GEI 1) Embankment Material Not applicable

GEI 2) Cutoff Type Not applicable

GEI 3) Impervious Core Not applicable

GEI 4) Internal Drainage System Not applicable

GEI 5) Miscellaneous Not applicable

GEI b. Crest

GEI 1) Vertical Alignment Not applicable

GEI 2) Horizontal Alignment Not applicable

GEI 3) Lateral Movement Not applicable

GEI 4) Surface Cracks Not applicable

GEI 5) Miscellaneous Not applicable

GEI c. Upstream Slope

GEI 1) Slope (Estimate H:V) Not applicable

GEI 2) Undesirable Growth or Debris, Animal Burrows Not applicable

GEI 3) Sloughing, Subsidence or Depressions Not applicable

GEI 4) Slope Protection Not applicable

GEI 5) Surface Cracks or Movement at Toe Not applicable

GEI d. Downstream Slope

GEI 1) Slope (Estimate - H:V) Not applicable

GEI 2) Undesirable Growth or Debris, Animal Burrows Not applicable

GEI 3) Sloughing, Subsidence or Depressions Not applicable

GEI 4) Surface Cracks or Movement at Toe Not applicable

GEI 5) Seepage Not applicable

GEI 6) External Drainage System (Ditches, Trenches, Blanket) Not applicable

GEI 7) Condition Around Outlet Structure Not applicable

GEI 8) Seepage Beyond Toe Not applicable

GEI e. Abutments - Embankment Contact Not applicable

GEI 1) Erosion at Contact Not applicable

GEI 2) Seepage Along Contact Not applicable

3. DRAINAGE SYSTEM

GEI a. Description of System None observed

GEI b. Condition of System Not applicable

GEI c. Discharge from Drainage System Not applicable

4. INSTRUMENTATION (Monumentation/Surveys, Observation Wells, GEI Weirs, Piezometers, Etc.)

None observed

5. RESERVOIR

GEI a. Slopes Moderately steep slopes. Some bedrock exposures. Tree-covered.

GEI b. Sedimentation Sediment behind dam up to an elevation about 10 feet above downstream invert of low-level-outlet. Owner's representative reports that considerable sediment is discharged when low-level outlet is opened.

GEI c. Unusual Conditions Which Affect Dam None observed

6. AREA DOWNSTREAM OF DAM

a. Downstream Hazard (No. of Homes, Highways, etc.) [illegible] OF WOODS LOCATED ON DOWNSTREAM AREA IS MAIN [illegible]

GEI b. Seepage, Growth Tailwater at downstream toe of dam - seepage if any, cannot be observed. Trees growing in area immediately downstream of dam.

GEI c. Evidence of Movement Beyond Toe of Dam None observed.

d. Condition of Downstream Channel ABOUT 40'± WIDE D/S OF DAM [illegible] HAS THICK TREE GROWTH ALONG BANKS D/S.

7. SPILLWAY(S) (Including Discharge Channel)

a. General [illegible] STONE MASONRY SPILLWAY SECTION OF CENTER OF STONE MASONRY DAM. REMAINDER OF SPILLWAY SECTION OF DAM W/ CONCRETE CAP. CAP IS APPROX 3.5' [illegible] MAIN DAM. CREST IS LEVEL TO ABUTMENTS.

b. Conditon of Service Spillway STONE MASONRY ON D/S SIDE OF CREST IS WEATHERING - SOME STONE IS WORN + OTHERS ARE MISSING. THERE IS A 20' CAP ON RIGHT SIDE OF SPILLWAY. TOP COURSE OF STONE MASONRY IS TO DEPTH OF 0.9' BELOW NORMAL CREST ON LEFT U/S SIDE OF SPILLWAY. SOME STONE MASONRY + CONCRETE CAP IS BROKEN UP FOR 30± FEET. 20' FROM RIGHT END 30' OF SPILLWAY WEIR CAP IS MISSING + THEN BALANCE REMOVED + DETERIORATED ACROSS DAM. MORTAR MISSING + STONES BROKEN + WEATHERED FOR UPPERMOST STONE COURSE OF SPILLWAY (MUCH OF STONE MASONRY IS OBSCURED BY FLOW OVER SPILLWAY). AS NOTED MOST FLOW APPEAR TO BE IN BETTER SHAPE (YET AS WEATHERED) BUT STILL SOME MISSING + BROKEN MASONRY

c. Condition of Auxiliary Spillway N/A

4599 Name of Dam Thornes Dam Date May 5, 1981 6

d. Condition of Discharge Channel OVERFLOW [illegible]
OF DAM TO [illegible] CHANNEL W/ EXPOSED [illegible]
[illegible] (ABOUT 150') NEAR [illegible]
DAM [illegible] TO [illegible], STONE [illegible] AT TOE OF
SPILLWAY SECTION, [illegible] AREA OF
[illegible] STONE MASONRY [illegible]
[illegible] MISSING MORTAR.

8. RESERVOIR DRAIN/OUTLET

a. Type: Pipe ✓ Conduit ______ Other ______

b. Material: Concrete ______ Metal ✓ Other ______ (see H&H DATA CHECKLIST APPENDIX C)

c. Size: 48" DIAMETER Length [illegible]

d. Invert Elevations: Entrance [illegible]8 ± EST. Exit 588 ± (FIELD MEASUREMENT)

e. Physical Condition (Describe)

Unobservable ONLY END [illegible] D/S OF CLOSED GATE WAS OBSERVABLE

1) Material CAST IRON PIPE

2) Joints GOOD Alignment GOOD

3) Structural Integrity [illegible] MISSING ON RIGHT SIDE NEAR GATE END. STONE MASONRY SURROUNDING PIPE IS EXPOSED [illegible] SOUND EXCEPT FOR MISSING PIECE OF PIPE.

4) Hydraulic Capability 1' OF TAILWATER IN PIPE W/ GATE CLOSE AT TIME OF INSPECTION. NO FLOW RESTRICTIONS IN PIPE. NOT KNOWN IF GATE OPENS ALL THE WAY.

f. Means of Control: Gate ✓ Valve ____ Uncontrolled ____

Operation: Operable ✓ Inoperable ___ Other ______

Present Condition (Describe) [illegible] IS VALVE WRENCH FOR OPERATING NUT ON MECHANISM. UNOBSERVABLE BECAUSE STONE MASONRY VAULT W/ ACCESS MANHOLE IS FULL OF [illegible]. D/S SIDE OF GATE VISIBLE & HAS SOME LEAKAGE WHEN CLOSED & IT IS RUSTY.

g. Other Outlets (water mains, diversion pipes) ______

NONE.

9. STRUCTURAL

a. Concrete Surfaces CONCRETE DAM UNWEATHERED AND IN FAIR CONDITION. MINOR CRACKING IS EVIDENT DOWN ANA[illegible] FACE, SPILLWAY [illegible] AM FACE OF [illegible]

b. Structural Cracking

NONE OBSERVED.

c. Movement - Horizontal & Vertical Alignment(Settlement)

ASPECTS OF [illegible]

GEI d. Junctions with Abutments or Embankments Abutments are bedrock (phyllite) in good condition. Trees growing on thin soil cover on both abutments. Logs have been dumped on the contact between the downstream face and the left abutment.

GEI e. Drains - Foundation, Joint, Face SEEPAGE THROUGH STONE MASONRY JOINTS (SEE 9.g.). NO DRAINS OBSERVED.

f. Water Passages, Conduits, Sluices SPILLWAY PASSAGE THROUGH DAM IS UNLINED RIVER. (SEE 9.)

GEI g. Seepage or Leakage Estimated 15 gpm seepage through stone-masonry joints between left abutment and Station 0+60. Water flowing over dam obscures downstream face between Stations 0+60 and 1+85. Estimated 10 gpm seepage through stone-masonry joints between Station 1+85 and right abutment.

h. Joints - Construction, etc. STONE MASONRY JOINTS - MORTAR LOSS, MISSING IN SPOTS & CRACKS THROUGH JOINTS. [illegible] INTERFACE W/ MASONRY [illegible].

GEI i. Foundation Not visible. Bedrock is exposed on both sides of stream channel at downstream toe of dam. Channel bottom consists of boulders, gravel, sand, and silt.

GEI j. Abutments Bedrock exposed at contacts between downstream face of dam and both abutments.

k. Control Gates NONE.

l. Approach & Outlet Channels [illegible] & IS FILLED IN (10' DIA.) AT CENTER OF DAM. [illegible] DISCHARGES INTO CHANNEL D/S TOE OF DAM.

m. Energy Dissipators (Plunge Pool, etc.) NONE OBSERVED. STONE MASONRY WALL [illegible] SIDE OF DISCHARGE CHANNEL. PURPOSE UNKNOWN. IT IS NEAR CENTER OF CHANNEL & NOT ERODED. DAM Y EXTENDING TO ITS FACE OF WALL MISSING, MORTAR DETERIORATED.

n. Intake Structures UNOBSERVED.

o. Stability MASONRY SECTION IS RATHER THIN.

p. Miscellaneous

8876 Name of Dam Thornes Dam Date May 5, 1981 9

10. APPURTENANT STRUCTURES (Power House, Lock, Gatehouse, Service Bridge, Other)

a. Description: [illegible]

Condition: [illegible] MINOR CRACKING & LOOSENING OF SOME STONES & MORTAR AT EDGES & CORNERS. SEVERAL STONES MISSING ALONG EDGES

11. MISCELLANEOUS MECHANICAL/ELECTRICAL EQUIPMENT

a. Description: N/A

b. Condition:

12. OTHER

33 9

APPENDIX C

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

CHECKLIST AND COMPUTATIONS

TABLE OF CONTENTS

4595

PHASE I INSPECTION

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA CHECKLIST

Name of Dam THORNES DAM Fed. Id.# NY 00793

1. AREA-CAPACITY DATA

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
a. Top of Dam (AVERAGE)	617.5	4.7 EST.	44
b. Design High Water (Max. Design Pool)	UNKNOWN		
c. Auxiliary Spillway Crest	N/A		
d. Pool Level with Flashboards	N/A		
e. ~~Service~~ Spillway Crest (NOMINAL OR DESIGN)	615	3.0	35

2. DISCHARGES

	Volume (cfs)
a. Average Daily	UNKNOWN
b. Spillway @ Top of Dam	1,790
c. Spillway @ Design High Water	UNKNOWN
d. Service Spillway @ Auxiliary Spillway Crest Elevation	N/A
e. Low Level Outlet (Normally closed. w/ W.S. at spillway crest, est. Q = 300 cfs)	0
f. Total (of all facilities) @ Top of Dam	1,790
g. Maximum Known Flood (HURRICANE IN 1950's CAUSED WATER SURFACE LEVEL OF 2.1' OVER SPILLWAY CREST)	1,380 ± ≈58 cms
h. At Time of Inspection (MAY 5, 1981, W.S. @ EL 614.6. Flow over deteriorated parts of spillway.)	20 ±

4596

3. TOP OF DAM

Average Elevation 617.5

a. Type [illegible] STONE MASONRY GRAVITY DAM

b. Width 4' ± Length 227' (80' w/o SPILLWAY)

c. Spillover OVERFLOW SECTION

d. Location IN CENTER OF DAM

4. SPILLWAY

	SERVICE		AUXILIARY
a.	615 (NOMINAL OR DESIGN)	Elevation	N/A
b.	OVERFLOW	Type	
c.	147'	Width	
	Type of Control		
d.	✓	Uncontrolled	
	Controlled:		
e.		Type (Flashboards; gate)	
f.		Number	
g.		Size/Length	
h.	STONE MASONRY W/ CONCRETE CAP	Invert Material	
i.		Anticipated Length of Operating Service	
j.	N/A	Chute Length	
k.	~17' TO SILT ON U/S SIDE	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	
l.		Other	

4597

5. OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES

a. Type: Gate____ Sluice____ Conduit √ Penstock____

b. Shape CAST IRON PIPE

c. Size 48" DIAMETER

d. Elevations: Entrance Invert 588 ± ESTIMATE

Exit Invert 588 ± FIELD MEASUREMENT

e. Tailrace Channel: Elevation N/A

6. FLOOD WATER CONTROL SYSTEM

a. Warning System NONE.

b. Method of Controled Releases (mechanisms)

GATE MANUALLY OPERATED BY PUTTING VALVE WRENCH ON OPERATING NUT.

7. CLIMATOLOGICAL GAGES REFERENCES 21+22

a. Type NON-RECORDING TEMPERATURE + PRECIPITATION GAGE INDEX # 5334

b. Location MILLBROOK, N.Y. LAT. 41°51', LONG. 73°37', ~5 MILES N.W. OF DAM

c. Period of Record 1940 TO PRESENT

d. Maximum Reading UNKNOWN Date____

8. STREAM GAGES REFERENCE 23

a. Type WATER-STAGE RECORDER USGS GAGE # 01200000

b. Location TENMILE RIVER NEAR GAYLORDSVILLE, CONN.

LAT. 41°39'32", LONG. 73°31'44", ~10 MILES SOUTH OF DAM

c. Period of Record OCTOBER 1929 TO PRESENT

d. Maximum Reading 17400 cfs = 85.7 cms Date AUGUST 19, 1955
DA = 203 SM

9. OTHER REFERENCE 24

AT TENMILE RIVER NEAR WASSAIC, NY, ABOUT 1.5 MILES SE OF DAM, MAX Q = 3720 cfs ± 31.0 csm FOR DA = 120 SM & PERIOD OF RECORD 1960-73

6169

10. DRAINAGE BASIN CHARACTERISTICS

a. Drainage Area 23.91 SQ. MILES OR 15,302 ACRES

b. Land Use - Type WOODLAND + FARMLANDS

c. Terrain - Relief SOME FLAT AREAS + HILLY AREAS W/ SLOPES OF UP TO 25%

d. Surface - Soil GLACIAL TILL (?)

e. Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

NONE KNOWN.

f. Potential Sedimentation Problem Areas (natural or man-made; present or future)

SEDIMENT BUILT UP ALONG U/S FACE OF DAM.

g. Potential Backwater Problem Areas for Levels at Maximum Storage Capacity (including surcharge storage)

NONE.

h. Dikes - Floodwalls (overflow & non-overflow) - Low Reaches Along the Reservoir perimeter

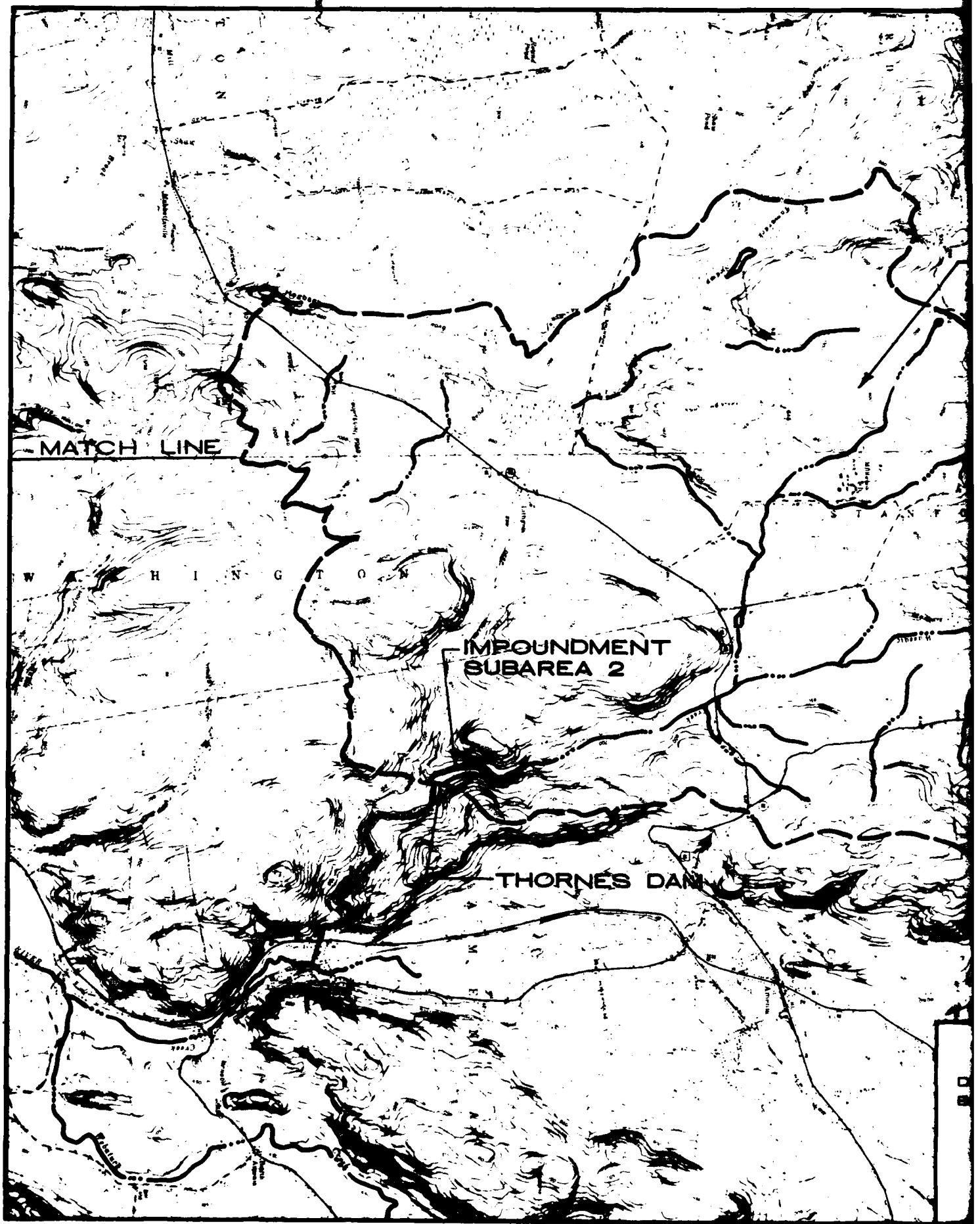
Location NONE.

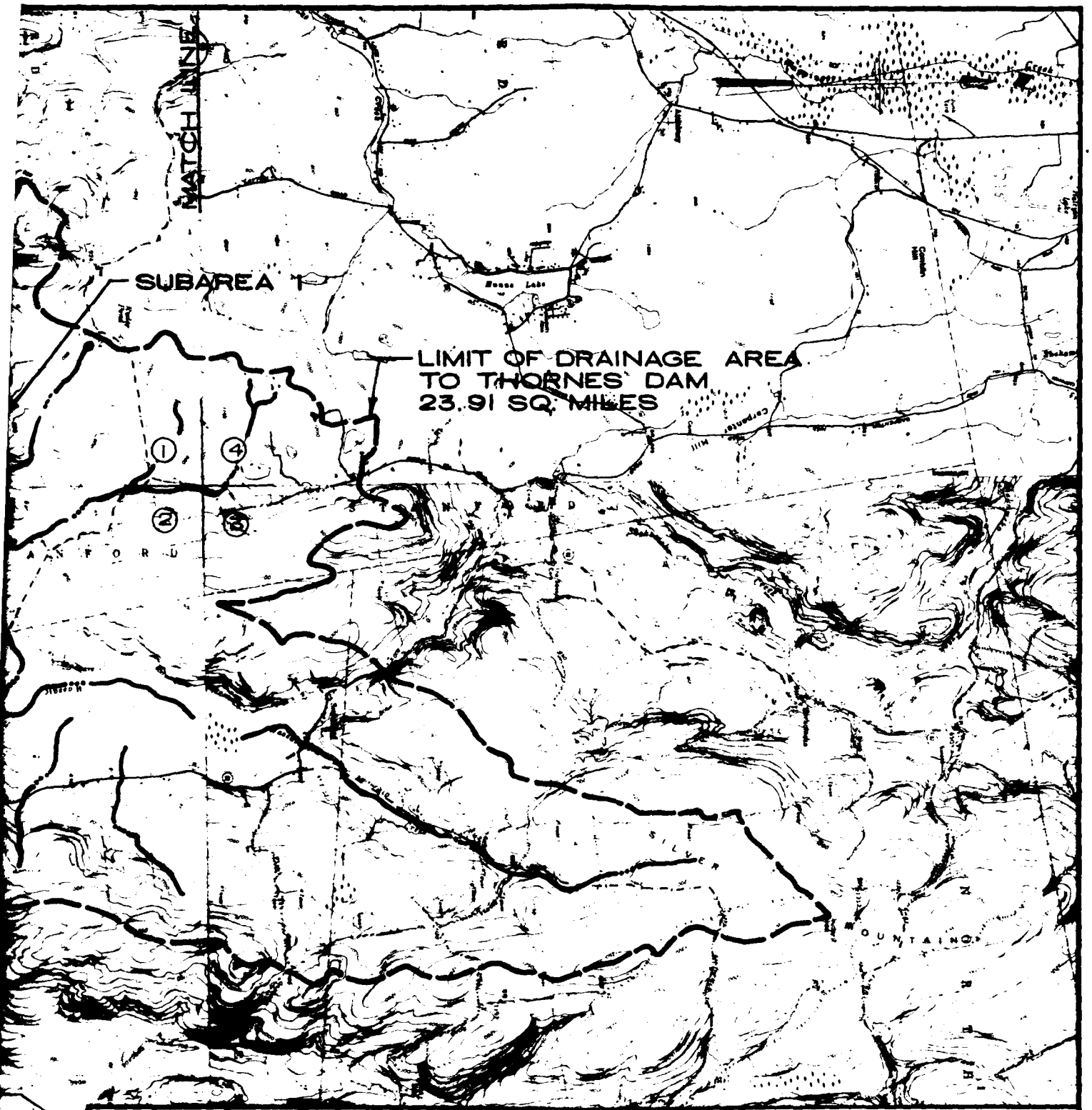
Elevation

i. Reservoir

Length @ ~~Maximum Design~~ SPILLWAY CREST Pool 1,400± (feet)

Length of Shoreline (@ ~~Design~~ Spillway Crest) 3,400± (feet)


MATCH LINE
IMPOUNDMENT
SUBAREA 2
THORNES DAM



APPROXIMATE SCALE IN FEET
0 4000 8000

DATUM - NGVD 1929, 10' CONTOUR INTERVAL

BASE MAP - 7.5' USGS TOPO QUADS, REDUCED 50%
(1) MILLBROOK, NY - 1960
(2) AMENIA, NY - CONN - 1958
(3) MILLERTON, NY - CONN - 1955
- 7.5' NYSDOT TOPO QUAD, REDUCED 50%
(4) PINE PLAINS, NY - 1973

THORNES DAM
DRAINAGE AREA MAP

TOWN OF AMENIA	DUTCHESS CO., NY
SCALE 1" = 4000'	DATE JANUARY 1981

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COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB THORNES DAM
SHEET NO ____ OF ____
CALCULATED BY CLV DATE 5/14/81
CHECKED BY [illegible] DATE 7/30/81
SCALE 58.01.00013

ELEVATION-AREA-STORAGE COMPUTATIONS

RESEVOIR VOLUME: COMPUTED BY HEC-1 DB PROGRAM USING METHOD OF CONIC SECTIONS $\Delta V_{1,2} = h/3(A_1 + A_2 + \sqrt{A_1 A_2})$

	ELEVATION[1] (NGVD-ft)	INPUT AREA[1] (acres)	VOLUME (By HEC-1 DB Program) (acre-feet)
	580[4]	0 [2]	0
SPILLWAY CREST	615[3]	3.0	35
TOP OF DAM	617.5[5]	4.4 EST.	44
	620	5.7	56
	640	10.1	212

(1) FROM USGS CONTOUR MAPPING.
(2) ASSUMED.
(3) EST. USGS AT LEFT END OF SPILLWAY. SPILLWAY VARIES FROM EL 614.1 TO EL 615.2. LOW SPOTS DUE TO DETERIORATION.
(4) EST. FROM FIELD MEASUREMENT.
(5) " " " " . TOP VARIES FROM EL 617.3 ON RIGHT TO EL 618.1 ON LEFT.

DRAINAGE AREA

	AREA (acres)	(square miles)
WATERSHED DIRECT TO RESERVOIR (SUBAREA 1)	15,299.3	23.905
RESERVOIR SURFACE (SUBAREA 2) @ SPILLWAY CREST EL = 615	3.0	.005
TOTAL	15,302.3	23.910

Form CTM-405

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JOB THORNES DAM
SHEET NO. ____ OF ____
CALCULATED BY CLV DATE 5/14/81
CHECKED BY [illegible] DATE 7/30/81
SCALE 58.01.00013

DRAINAGE AREA DATA FOR HEC-1 DB MODEL

SUBAREA 1: AREA TRIBUTARY DIRECTLY TO RESERVOIR
AREA = 23.905 SQUARE MILES

LOSS RATES: 1.0" - INITIALLY
0.1"/HOUR - CONSTANT LOSS RATE

UNIT HYDROGRAPH PARAMETERS: USE SNYDER METHOD

A = DRAINAGE AREA = 23.905 SQUARE MILES
L = LENGTH OF MAIN WATERCOURSE TO UPSTREAM LIMIT OF DRAINAGE AREA = 8.33 MILES
L_{CA} = LENGTH ALONG MAIN WATERCOURSE TO POINT OPPOSITE THE CENTROID OF THE DRAINAGE AREA = 2.46 MILES
C_t = SNYDER'S BASIN COEFFICIENT = 2.0 ASSUMED AVERAGE
C_p = SNYDER'S PEAKING COEFFICIENT = .625 ASSUMED AVERAGE
t_p = STANDARD LAG IN HOURS = $C_t(LL_{CA})^{0.3}$ = 4.94 HOURS

∴ USE t_p = 4.9 HOURS

REQUIRED UNIT RAINFALL DURATION = t_r
$t_r = \frac{t_p}{5.5} = \frac{4.94}{5.5} = 0.90$ hr = 54 min max
USE t_r = 10 min < 54 min OK

SUBAREA 2: RESERVOIR SURFACE, AREA = .005 SQ. MILES = 3.0 ACRES

LOSS RATES: NONE BECAUSE RAINFALL ≈ RUNOFF FOR WATER SURFACE

UNIT HYDROGRAPH PARAMETERS:

FOR U.H. W/ 10 MINUTE DURATION + 1" RAIN

$$\bar{Q} = \frac{A(1")}{t} = \frac{3.0 \text{ acres}(1")}{10 \text{ minutes}} \left(\frac{43{,}560 \text{ sq FT}}{1 \text{ acre}}\right)\left(\frac{1 \text{ FT}}{12 \text{ inches}}\right)\left(\frac{1 \text{ minute}}{60 \text{ seconds}}\right)$$

$\bar{Q}$ = 18 cfs (W/O LOSS RATE)

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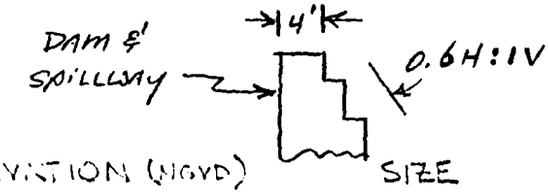
JOB THORNES DAM
SHEET NO ____ OF ____
CALCULATED BY ELV DATE 7/14/81
CHECKED BY GMB DATE 7/30/81
SCALE 58.01.00013



DISCHARGE COMPUTATIONS

DAM APPURTENANCE	ELEVATION (NGVD)	SIZE
OVERFLOW SPILLWAY	CREST EL = 615 (NOMINAL OR DESIGN EL)	147' CREST LENGTH 4' " WIDTH
DAM (EXCLUDING SPILLWAY)	TOP OF DAM EL = 617.5 (AVERAGE EL)	80' CREST LENGTH (EXCLUDING SPILLWAY) 4' CREST WIDTH
OUTLET PIPE	INVERT EL = 588.±	48" DIA

FOR FLOW OVER DAM + SPILLWAY : $Q = 3.087 L H^{1.5}$ ← INPUT

(APPROXIMATE W/ FORMULA FOR CRITICAL FLOW OVER IDEAL BROAD-CRESTED WEIR, REF. 9. NEGLECT ABUTMENT CONTRACTIONS)

	ELEVATION (NGVD)	$H_{SPILLWAY}$ (ft.)	H_{DAM} (ft.)	Q_{OUTLET} (cfs)	$Q_{SPILLWAY}$ (cfs)	Q_{DAM} (cfs)	Q_{TOTAL} (cfs)
SPILLWAY CREST	615	0	0	0	0	0	0
	616	1	0	ASSUMED CLOSED	454	0	454
	617	2	0		1,284	0	1,284
TOP OF DAM	617.5	2.5	0		1,794	0	1,794 SAY 1,790
	618	3	.5		2,358	87	2,445
	619	4	1.5		3,630	454	4,084
	620	5	2.5		5,073	976	6,049
	621	6	3.5		6,669	1,617	8,286
	622	7	4.5		8,404	2,357	10,761
	623	8	5.5		10,268	3,185	13,453
	625	10	7.5	0	14,350	5,072	19,422

Form CTM-4HD

```
A NYD DAM INSPECTION: DACW51-81-C-0014
A NY00793, THORNES DAM, 80.00853
A OVERTOPPING ANALYSIS  TH01
B   288       0      10                                                  4
B1      5
J       1       2       1
J1   1.0     0.5
K       0    SA-1                                              1
K1 SUBAREA 1 RUNOFF COMPUTATION
M       1       1  23.905          23.910                                1
P                 21     101     114     124     133
T                                                  1.0     .10
N     4.5    .625
X      -2              1
K       0    SA-2                                              1
K1 SUBAREA 2 RUNOFF COMPUTATION
M       1      -1    .005          23.910                                1
P                 21     101     114     124     133
T                                                  0       0
U       1
U1     18
X      -2                      1
K       2   SA-2C                                              1
K1 COMBINING HYDROGRAPHS 1 & 2
K       1     RES                       2                      1
K1 ROUTING FLOWS THROUGH RESERVOIR
Y                               1       1
Y1      1                                                -615       0
SA      C      3.0     5.7    10.1
SE    580    615     620     640
S*    615    147   3.087     1.5
SD 617.5   3.087     1.5      80
K      99
A
A
A
A
A
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE: 7/30/81
     TIME: 7:49 AM

                    NYD DAM INSPECTION: DACW51-81-C-0014
                    NY00793, THURNES DAM, 80.00853
                    OVERTOPPING ANALYSIS  THD1

                                  JOB SPECIFICATION
          NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC   IPLT   IPRT  NSTAN
         288       0      10       0       0       0       0      0      4      0
                                JOPER     NWT   LROPT   TRACE
                                    5       0       0       0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 2 LRTIO= 1
                    RTIOS=   1.00   0.50

**********  **********  **********  **********  **********

                                SUB-AREA RUNOFF COMPUTATION

                    SUBAREA 1 RUNOFF COMPUTATION
                          ISTAQ   ICOMP   IECON   ITAPE   JPLT   JPRT  INAME  ISTAGE  IAUTO
                           SA-1       0       0       0      0      0      1       0      0

                                    HYDROGRAPH DATA
          IHYDG   IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO  ISNOW  ISAME  LOCAL
              1      1   23.90    0.00   23.91    0.00   0.000      0      1      0

                                    PRECIP DATA
                          SPFE     PMS      R6     R12     R24     R48     R72     R96
                          0.00   21.00  101.00  114.00  124.00  133.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.829

                                    LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.00

                                UNIT HYDROGRAPH DATA
                                TP=  4.90   CP=0.63   NTA=  0

                                RECESSION DATA
                          STRTQ=   -2.00   QRCSN=   0.00   RTIOR= 1.00

          UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=   4.86 HOURS, CP= 0.62  VOL= 0.95
            13.     50.    103.    167.    240.    319.    404.    494.    588.    685.
           785.    887.    992.   1099.   1207.   1316.   1423.   1523.   1614.   1697.
          1770.   1835.   1892.   1940.   1980.   2010.   2032.   2044.   2046.   2038.
          2013.   1969.   1905.   1837.   1772.   1708.   1647.   1588.   1532.   1477.
          1424.   1373.   1324.   1277.   1231.   1187.   1145.   1104.   1065.   1027.
           990.    955.    920.    888.    856.    825.    796.    767.    740.    714.
           688.    663.    640.    617.    595.    574.    553.    533.    514.    496.
           478.    461.    445.    429.    413.    399.    384.    371.    358.    345.
           332.    321.    309.    298.    287.    277.    267.    258.    248.    240.
           231.    223.    215.    207.    200.    193.    186.    179.    173.    167.
```

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	23.14	19.43	3.71	1328077.
										(588.1(	493.1(	94.3(	37606.9(

PART

SUB-AREA RUNOFF COMPUTATION

SUBAREA 2 RUNOFF COMPUTATION

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	SA-2	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	0.00	0.00	23.91	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.00	101.00	114.00	124.00	133.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.629

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

RECESSION DATA

STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	23.14	23.14	0.00	407.
										(588.1(	588.1(	0.1(	11.5(

COMBINE HYDROGRAPHS

COMBINING HYDROGRAPHS 1 & 2

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	SA-2C	2	0	0	0	0	1	0	0

HYDROGRAPH ROUTING

ROUTING FLOWS THROUGH RESERVOIR

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	RES	1	0	0	2	0	1	0	0

ROUTING DATA

CLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-615.	0

SURFACE AREA= 0. 3. 6. 10.

CAPACITY=	0.	39.	56.	212.
ELEVATION=	580.	615.	620.	640.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
615.0	147.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	CCOD	EXPD	DAMWID
617.5	3.1	1.5	40.

PEAK OUTFLOW IS 30810. AT TIME 44.17 HOURS

1 PART

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 0.50
HYDROGRAPH AT	SA-1	23.90	1	30809.	15405.
		(61.91)		(872.42)(	436.21)(
HYDROGRAPH AT	SA-2	0.00	1	54.	27.
		(0.01)		(1.53)(	0.77)(
2 COMBINED	SA-2C	23.91	1	30810.	15405.
		(61.93)		(872.43)(	436.22)(
ROUTED TO	RES	23.91	1	30810.	15405.
		(61.93)		(872.44)(	436.22)(

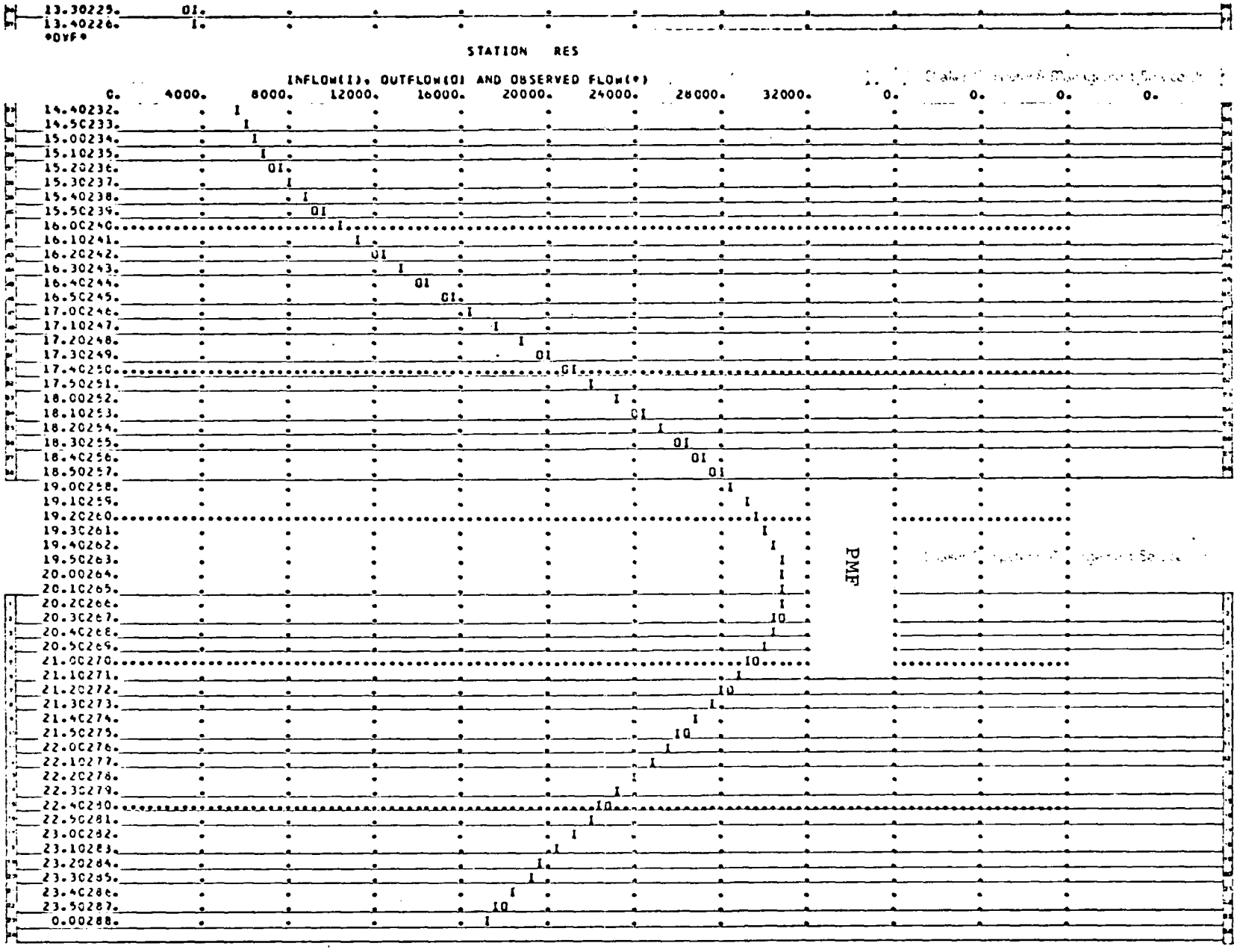
1 PART

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	615.00	615.00	617.50
STORAGE	35.	35.	44.
OUTFLOW	0.	0.	1794.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	628.31	10.81	111.	30810.	13.00	44.17	0.00
0.50	623.68	6.18	79.	15405.	10.33	44.17	0.00


13.30229. 01.
13.40226. I.
DVF
STATION RES
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 4000. 8000. 12000. 16000. 20000. 24000. 28000. 32000.
0. 0. 0. 0.
14.40232.
14.50233.
15.00234.
15.10235.
15.20236.
15.30237.
15.40238.
15.50239.
16.00240.
16.10241.
16.20242.
16.30243.
16.40244.
16.50245.
17.00246.
17.10247.
17.20248.
17.30249.
17.40250.
17.50251.
18.00252.
18.10253.
18.20254.
18.30255.
18.40256.
18.50257.
19.00258.
19.10259.
19.20260.
19.30261.
19.40262.
19.50263.
20.00264.
20.10265.
20.20266.
20.30267.
20.40268.
20.50269.
21.00270.
21.10271.
21.20272.
21.30273.
21.40274.
21.50275.
22.00276.
22.10277.
22.20278.
22.30279.
22.40280.
22.50281.
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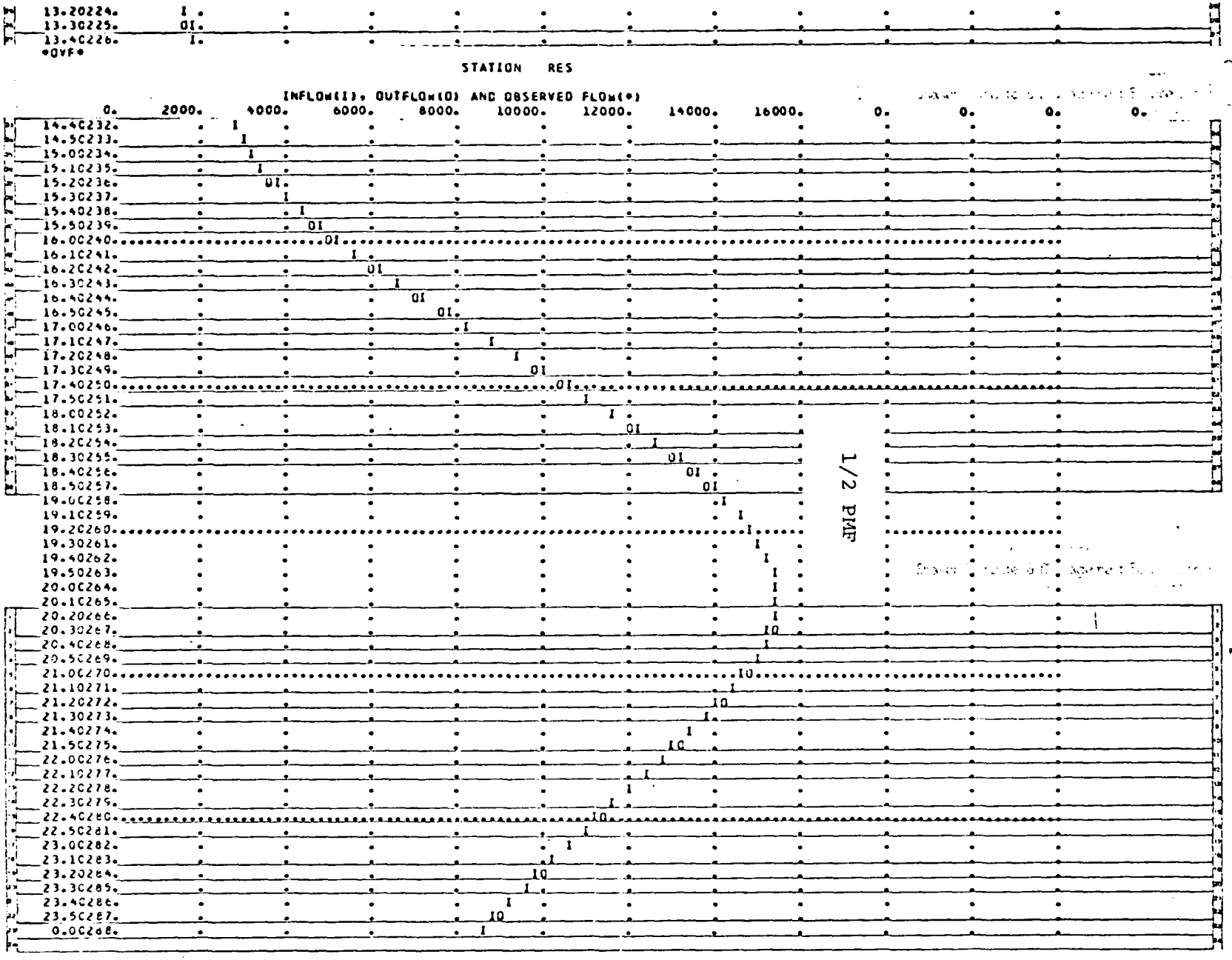
23.10283.
23.20284.
23.30285.
23.40286.
23.50287.
0.00288.
PMF


13.20224.
13.30225.
13.40226.
•OVF•
STATION RES
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 2000. 4000. 6000. 8000. 10000. 12000. 14000. 16000. 0. 0. 0. 0.
1/2 PMF

APPENDIX D

STABILITY ANALYSIS

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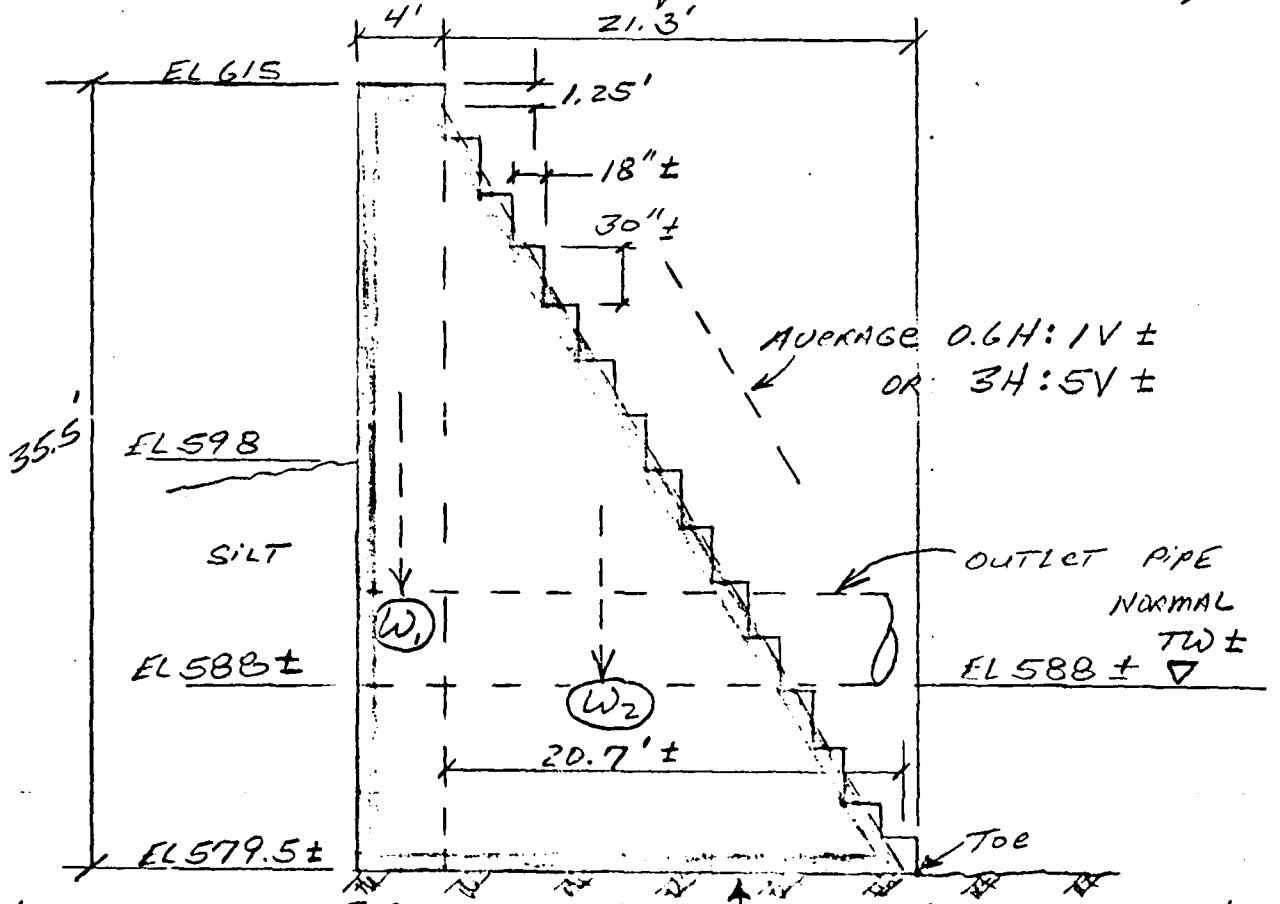
(518) 785-0976

JOB THORNES DAM
SHEET NO 1 OF 9
CALCULATED BY WRG DATE 7/31/81
CHECKED BY EAC DATE 8/4/81
SCALE 1/4" = 2'

STABILITY ANALYSIS OF OVERFLOW SECTION

CROSS SECTION FOR ANALYSIS (at about ℄ of dam where unsupported height is max., dimensions based on visual observation & rough field measurement)



Dead Load	Volume	× Unit wt.	= W	× Horiz. Moment Arm about toe	= M
W_1	4×35.5×1	0.160 kcf	= 22.72 k	4/2 + 21.3	= 529.38
W_2	1/2×20.7×34.25×1	0.160	= 56.72	2/3×21.3	= 805.40
		W_D =	79.44 k	ΣM =	1334.78 Ftk

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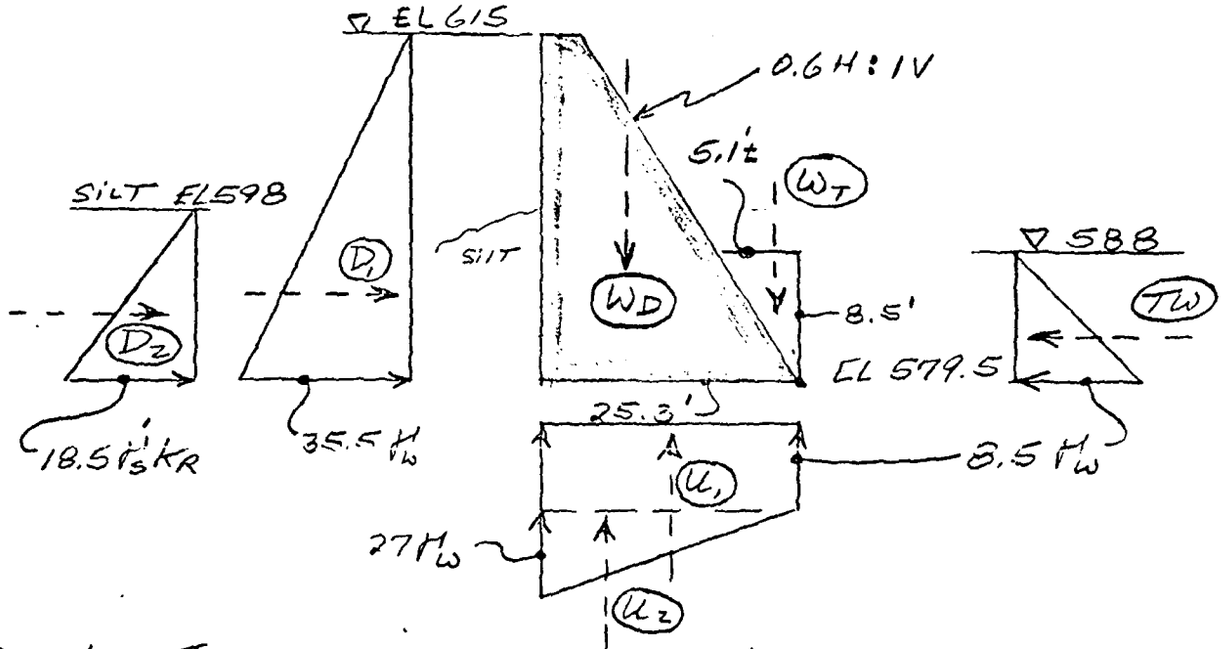
JOB THORNES DAM
SHEET NO 7 OF 9
CALCULATED BY FJB DATE 7/31/81
CHECKED BY FJL DATE 8/4/81
SCALE None

CASE 1 Normal pool at spillway crest, full HW & TW uplift, silt 17' below crest by measurement, TW about at outlet pipe by observation (8.5')

OVERTURNING



Resisting Forces	×	Moment Arm about toe	=	M_R
W_D = dead load = 79.44 K per sheet 1	×	(per sheet 1)	=	1334.78
W_T = normal TW wt. = $(\frac{1}{2} \times 5.1 \times 8.5) 0.0624 = 1.35$ K	×	5.1/3	=	2.30
TW = normal TW pressure = $(\frac{1}{2} \times 8.5 \times 0.0624) 8.5 = 7.25$ K	×	8.5/3	=	6.39
			ΣM_R =	1343.47 Ft-K

Driving Forces — M_D

D_1 = Normal HW pressure
$= (\frac{1}{2} \times 35.5 \times 0.0624) 35.5 = 39.32$ K × 35.5/3 = 465.28

D_2 = submerged silt pressure, where $H'_S = 120^{\#}/CF - 62.4$
$H'_S = 57.6$, say $H'_S = 58^{\#}/CF = 0.058$ kcf, ±
K_R = coeff. of horiz. earth pressure at rest = 0.5
$= (\frac{1}{2} \times 18.5 \times 0.058 \times 0.5) 18.5 = 4.96$ K × 18.5/3 = 30.60

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JOB THORNES DAM
SHEET NO 3 OF 9
CALCULATED BY MRG DATE 7/31/81
CHECKED BY EAC DATE 8/4/81
SCALE None

CASE 1 - OVERTURNING (cont'd) M_D

U_1 = normal TW uplift
$= (8.5 \times 0.0624 \times 25.3) = 13.42\ k \times 25.3/2 = 169.75$

U_2 = normal HW uplift
$= (1/2 \times 27 \times 0.0624) 25.3 = 21.31\ k \times 25.3 \times 2/3 = 359.47$

$\Sigma M_D = 1025.10$

$FS = \Sigma M_R / \Sigma M_D = 1343.47 / 1025.10 = (1.31)$

Resultant from toe $= d = \Sigma M_T / \Sigma V = \dfrac{\Sigma M_R - \Sigma M_D}{W_D + W_T - U_1 - U_2}$

$d = 318.37 / 46.06 = 6.91' \times b/25.3 = (0.27b) < 1/3\ b$

CASE 1 - SLIDING Assume horizontal failure plane along dam/rock contact (edges of foliations), same diagram as CASE 1, OVERTURNING ON SHEET 2.

Resisting Forces

Horiz. Resisting Force $= R_S = \Sigma V \tan\phi + C$ (Reference 1)

where C = cohesion along failure plane = 0
ϕ = Angle of sliding friction = 35° assumed along contact w/edges of rock foliations
ΣV = vertical effective force
$= W_D + W_T - U_1 - U_2 = 46.06\ k$

$R_S = 46.06 \tan 35° = 32.25\ k$

Driving Forces

Horiz Driving Force $= D_S = D_1 + D_2 - TW = 42.03\ k$

$FS = R_S / D_S = 32.25 / 42.03 = (0.77) < 1.0$ unstable

CASE 1A - Same as Case 1, except neglect silt entirely.

Overturning - $\Sigma M_D = 1025.10 - 30.60 = 994.50$
$FS = \Sigma M_R / \Sigma M_D = 1343.47 / 994.50 = (1.35)$

Sliding - $D_S = 42.03 - 4.96 = 37.07$
$FS = R_S / D_S = 32.25 / 37.07 = (0.87) < 1.0$ unstable

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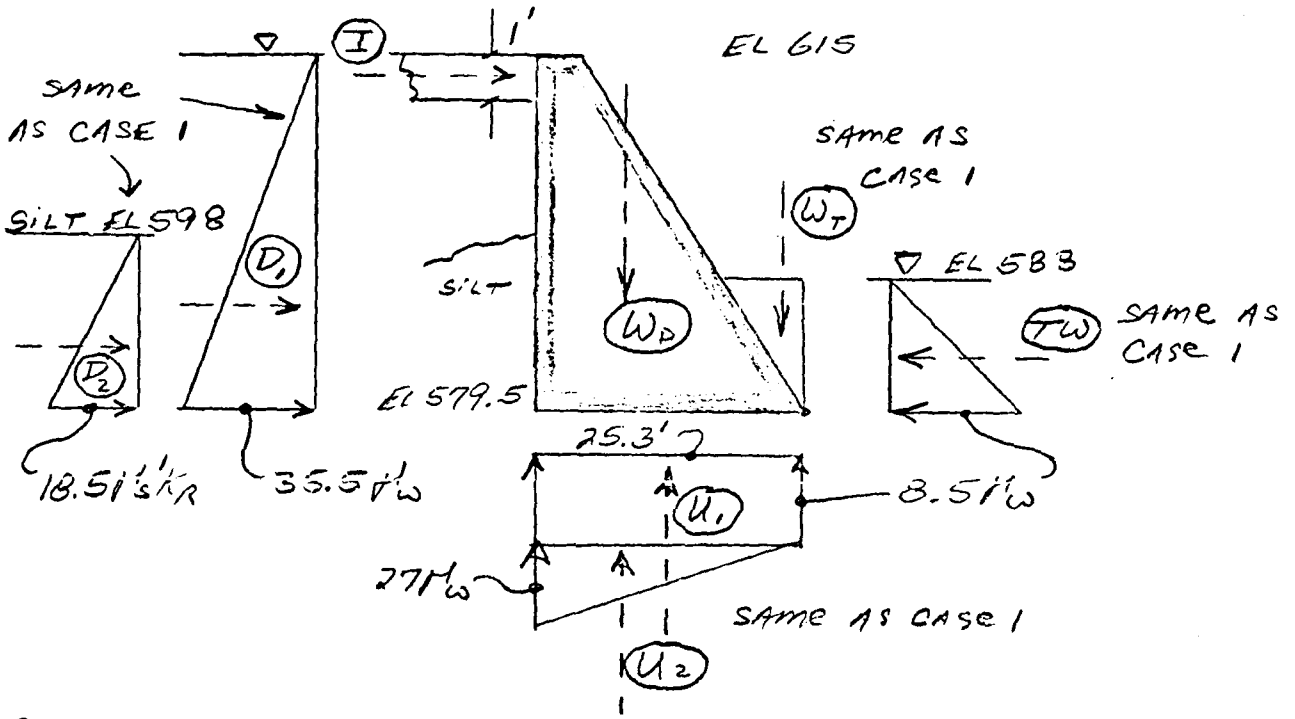
JOB THORNES DAM
SHEET NO 4 OF 9
CALCULATED BY FMB DATE 7/31/81
CHECKED BY FAC DATE 8/4/81
SCALE NONE

CASE 2 Normal pool plus ice load. Use ice load of 5 k/Ft for ice 1' thick.

OVERTURNING



Resisting Forces × Moment Arm About toe = M_R

All same as Case 1, sheet 2 → ΣM_R = 1343.47 Ft-k

Driving Forces

normal HW pressure, silt press. & normal uplift	same as Case 1, sheet 2 →	1025.10
I = ice load = 5k × (35.5 − 0.5)	=	175.0
	ΣM_D	1200.1 Ft-k

$FS = \Sigma M_R / \Sigma M_D = 1343.47 / 1200.1 =$ **1.12**

Resultant from toe = $d = \Sigma M_T / \Sigma V = \dfrac{\Sigma M_R - \Sigma M_D}{W_D + W_T - U_1 - U_2} = \dfrac{143.37}{46.06}$

$d = 3.11 \times \dfrac{b}{25.3} =$ **0.12 b**

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JOB THORNES DAM
SHEET NO 5 OF 9
CALCULATED BY JPB DATE 8/3/81
CHECKED BY FAC DATE 8/4/81
SCALE None

CASE 2 - SLIDING same failure plane & theory as Case 1, sheet 3.

Resisting Forces

Since ΣV same as Case 1, $R_s = 32.25$ k same as Case 1

Driving Forces

normal HW pressure, silt press. & normal TW press.
same as Case 1, sheet 3 → 42.03 k
Ice load = → 5.00 k
D_s = 47.03 k

$FS = R_s/D_s = 32.25/47.03 = (0.69) < 1.0$ unstable

ESTIMATE TAILWATER FOR FLOOD CONDITIONS

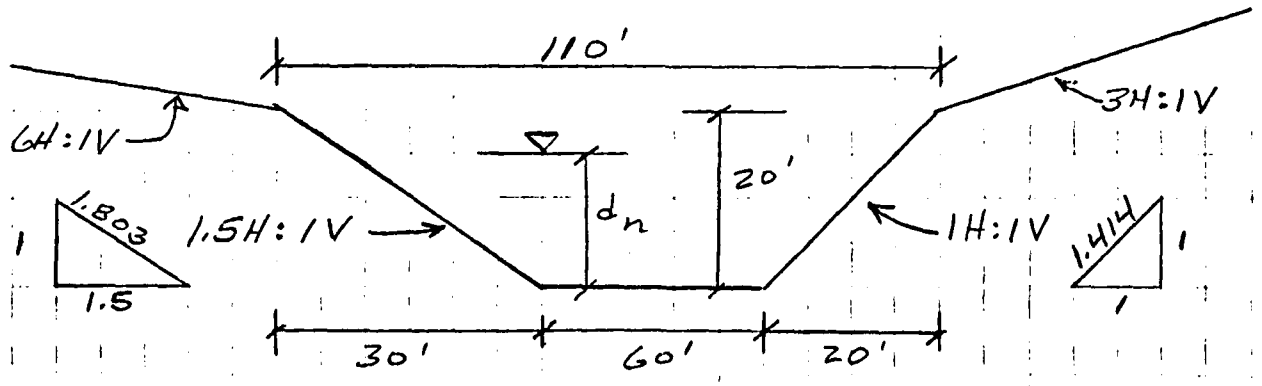
$Q = 15{,}400$ cfs for 1/2 PMF @ EL 623.7 per Tbl. 5.1
$= 30{,}800$ cfs " PMF @ EL 628.3 " " "

Assume uniform flow in d/s channel where:

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ (Mannings Eq., Ref. 8)

where A = cross sectional area of flow, ft^2
R = hydraulic radius = A/wetted perimeter (P).
n = roughness coeff. ≅ 0.04 for natural channel
S = slope of energy gradient, assume equal to avg. slope of channel ≅ 20'/1200 ≅ 0.017 per USGS sheet, like Appendix C-5

Approx. Channel Section 3.00' d/s of Dam



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JOB THORNES DAM
SHEET NO 6 OF 9
CALCULATED BY FMR DATE 8/3/81
CHECKED BY FAC DATE 8/4/81
SCALE None

ESTIMATE TAILWATER (cont'd)

$$Q = \frac{1.486}{0.04}(0.017)^{1/2} AR^{2/3} = 4.84\,AR^{2/3}$$

d_n	Top Width	A	P	$R^{2/3} = (A/P)^{2/3}$	$Q \cong 4.84AR^{2/3}$
2	65	125	66.4	1.53	924 cfs
5	72.5	331.3	76.1	2.68	4296
10	85	725	92.2	3.98	13974 ← ½ PMF
11	87.5	811.3	95.4	4.20	16477
14	95	1085	105.0	4.78	25102
15	97.5	1181.3	108.3	4.96	28353 ← PMF
16	100	1280	111.5	5.13	31790

By interpolation, for ½ PMF $Q = 15{,}400$ cfs, $d_n \cong 10.6$ (SAY 10')
& for PMF $Q = 30{,}800$ cfs, $d_n \cong 15.7$ (SAY 15')
(Round down to be conservative for stability)

CT 105

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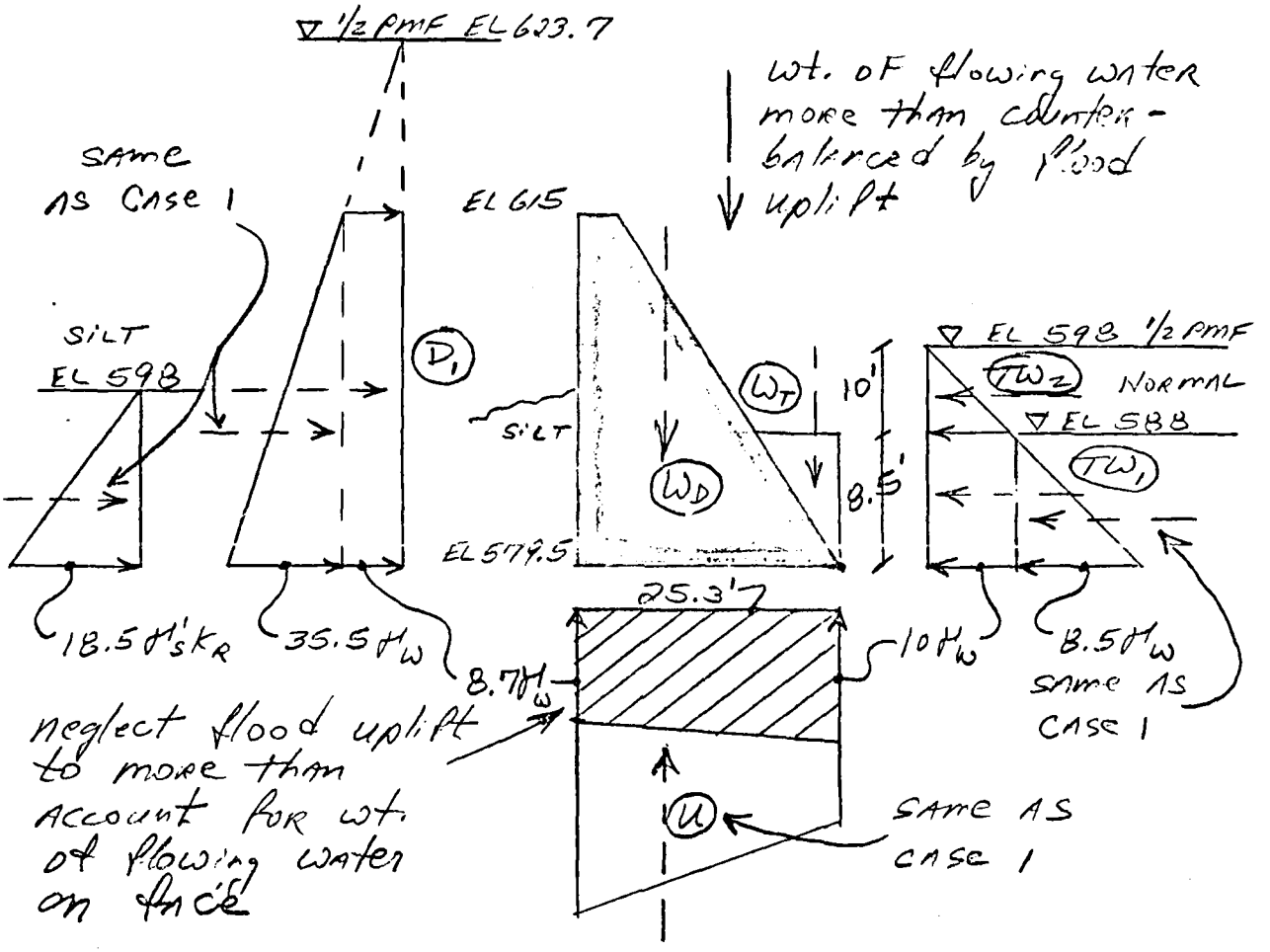
JOB THORNES DAM
SHEET NO 7 OF 9
CALCULATED BY GMR DATE 8/3/81
CHECKED BY FAC DATE 8/4/81
SCALE None

CASE 3 - 1/2 PMF pool, full HW & TW uplift, remainder same as Case 1.



Resisting Forces × Moment arm about toe = M_R

dead load, normal TW wt. & press. same as Case 1, sheet 2 → 1343.47

TW_1 = flood TW pressure
= (10 × 0.0624 × 8.5) = 5.30 × 8.5/2 = 22.54

TW_2 = flood TW pressure
= 1/2 × 10 × 0.0624 × 10 = 3.12 × 10/3 + 8.5 = 36.92

ΣM_R = 1402.93 Ft-k

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JOB THORNES DAM
SHEET NO 8 OF 9
CALCULATED BY GRG DATE 8/3/81
CHECKED BY F.A.C. DATE 8/4/81
SCALE None

CASE 3 OVERTURNING (cont'd)

Driving Forces × Moment arm about toe = M_D

normal HW pressure, silt press, normal HW & TW uplift same as Case 1, sheet 3 → 1025.10

D_1 = flood HW pressure

= 8.7 V 0.0624 × 35.5 = 19.27 × 35.5/2 = 342.09

ΣM_D = 1367.18 Ft-k

$FS = \Sigma M_R / \Sigma M_D = 1402.93 / 1367.18 =$ (1.03)

Resultant from toe = $d = \Sigma M_T / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{W_D + W_T - U}$

(same as Case 1 ΣV, sheet 3)

$d = 35.75 / 46.06 = 0.78' \times \frac{b}{25.3'} =$ (0.03 b)

CASE 3 SLIDING same failure plane & theory as Case 1, sheet 3 & same diagram as Case 3 overturning, sheet 7.

Resisting Forces

$R_S = f(\Sigma V)$, since ΣV same as for Case 1, sheet 3, R_S = 32.25 k

Driving Forces

normal HW pressure, silt pressure & normal TW pressure same as Case 1, sheet 3 → 42.03 k

D_1 = flood HW pressure = from o/t = 19.27 k

TW_1 = flood TW pressure = " o/t = ⊖ 5.30

TW_2 = " " " = " " = ⊖ 3.12

D_S = 52.88

$FS = R_S / D_S = 32.25 / 52.88 =$ (0.61) < 1.0 unstable

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JOB THORNES DAM
SHEET NO 9 OF 9
CALCULATED BY TMG DATE 8/3/81
CHECKED BY F.A.C. DATE 8/4/81
SCALE None

CASE 4 - PMF OVERTURNING same as Case 3, sheet 7 methodology, w/ TW d_n = 15'

Resisting Forces × Moment Arm about toe = M_R

dead load, normal TW wt. & pressure same as Case 3, sheet 7 → 1343.47

TW_1 = flood TW pressure = $(15 \times 0.0624 \times 8.5) = 7.96$ × 8.5/2 = 33.81

TW_2 = " " " = $(1/2 \times 15 \times 0.0624 \times 15) = 7.02$ × 15/3 + 8.5 = 94.77

ΣM_R = 1472.05 Ftk

Driving Forces × Moment arm About toe = M_D

normal HW pressure, silt press. normal HW & TW uplift same as Case 3 sheet 8 → 1025.10

D_1 = Flood HW pressure @ EL 628.3, 13.3' Above crest = $13.3 \times 0.0624 \times 35.5 = 29.46\,k \times 35.5/2$ = 522.95

ΣM_D = 1548.05 Ftk

$FS = \Sigma M_R / \Sigma M_D = 1472.05 / 1548.05 = (0.95) < 1.0$ unstable

Resultant from toe = $d = \Sigma M_T / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{\Sigma V}$ ΣV same as Case 3

$d = -76.00 / 46.06 = -1.65 \times \frac{b}{25.3} = (-0.07b)$

CASE 4 - PMF SLIDING same as Case 3, sheet 8 methodology

Resisting Forces $R_s = f(\Sigma V)$, since ΣV same as Case 3, sheet 8, R_s = 32.25 k

Driving Forces

normal HW pressure, silt pressure & normal TW pressure same as Case 3, sheet 8 → 42.03 k

D_1 = flood HW pressure = from o/t = 29.46

TW_1 = flood TW pressure = from o/t = ⊖ 7.96

TW_2 = " " " = " " = ⊖ 7.02

D_s = 56.51

$FS = R_s / D_s = 32.25 / 56.51 = (0.57)$ unstable

F— CT¼ 105.A

APPENDIX E

REFERENCES

THORNES DAM, NY 00793

PHASE I INSPECTION REPORT

REFERENCES

This is a general list of references pertinent to dam safety investigations. Not all references listed have necessarily been used in this specific report.

1. "Engineering and Design, National Program For Inspection of Non-Federal Dams", ER 1110-2-106, Dept. of the Army, Office of the Chief of Engineers, 26 September 1979, with Change 1 of 24 March 1980. Included as Appendix D of the ER is "Recommended Guidelines For Safety Inspection of Dams".

2. "HEC-1 Flood Hydrograph Package, Users Manual", The Hydrologic Engineering Center, U.S. Army Corps of Engineers, January 1973.

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19. "Guide for Making a Condition Survey of Concrete in Service", American Concrete Institute (ACI) Journal, Proceedings Vol. 65, No. 11, November 1968, pages 905-918.

20. "Housatonic River Basin, Master Manual of Water Control Regulation", New England Division, Corps of Engineers, June 1964, Revised October 1976.

21. "Climatological Data, Annual Summary, New York, 1979", Volume 91, No. 13, National Oceanic and Atmospheric Administration, Asheville, North Carolina.

22. "Climatological Data, New York, September 1980", Volume 92, No. 9, National Oceanic and Atmospheric Administration, Asheville, North Carolina.

23. "Water Resources Data For New York, Water Year 1979", Volume 1, USGS Water-Data Report NY-79-1, U.S. Geological Survey, Albany, New York, 1980.

24. "Maximum Known Stages and Discharges of New York Streams Through 1973", Bulletin 72, U.S. Geological Survey, 1976.

25. "Characteristics of New York Lakes (Gazetteer)", Bulletin 68, U.S. Geological Survey and NYS Department of Environmental Conservation, 1970.

26. "Gravity Dam Design", EM 1110-2-2200, U.S. Army Corps of Engineers, 25 September 1958, with Changes 1 & 2 included.

27. "Gravity Dam Design - Stability", ETL 1110-2-184, U.S. Army Corps of Engineers, 25 February 1974.

28. Terzaghi, Karl and Peck, Ralph B., Soil Mechanics in Engineering Practice, second edition, John Wiley & Sons, Inc., New York, N.Y., 1967.

29. "Geologic Map of New York", Lower Hudson Sheet, New York State Museum and Science Service, University of the State of N.Y., State Education Dept., Albany, N.Y., reprinted 1973.

30. "Landforms and Bedrock Geology of New York State", New York State Museum and Science Service, University of the State of N.Y., State Education Dept., Albany, N.Y., reprinted 1973.

APPENDIX F

AVAILABLE ENGINEERING DATA AND RECORDS

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APPENDIX F

SECTION F1

LOCATION OF AVAILABLE ENGINEERING DATA AND RECORDS

1. Owner: Turkey Hollow, Inc.
   Box AC
   Millbrook, NY 12545
   Attn: Jesse Bontecou, President
   914-868-1975

   Michael M. Bontecou, Operator
   Bontecou Rd.
   Millbrook, NY 12545
   914-677-5245

   Available: No data except home movies of high water during hurricane in 1950's (not reviewed).

2. Designer: Unknown.

3. Construction Contractor: Unknown.

4. Agency: NYS Department of Environmental Conservation
   50 Wolf Road
   Albany, NY 12233
   Attn: George Koch, P.E., Chief, Dam Safety Section
   518-457-5557

   Available: Letters and inspection report.

4585

PHASE I INSPECTION

CHECKLIST FOR GENERAL ENGINEERING DATA
& INTERVIEW WITH DAM OWNER

Name of Dam THORNES DAM Fed. Id.# NY 00793

Date May 5, 1981 Interviewer(s) Thomas P. Bennedum

Dam Owner/Representative(s) Interviewed, Title & Phone#

Michael M. Bontecou, Operator & part of family corporation, 914-677-5245

1. OWNERSHIP (name, title, address & phone #) Since about 1950, Twisty Hollow, Inc., Box AC, Millbrook, NY 12545 Attn: Jesse Bontecou, President, 914-868-1975

2. OPERATOR (name, title, address & phone # of person responsible for day-to-day operation) no one really designated, but could be considered: Michael M. Bontecou, Bontecou Rd., Millbrook, NY 12545, 914-677-5245

   a. Operator Full/Part time Part time

3. PURPOSE OF DAM

   a. Past Recreation. Thornes family sold to McClay, then McClay to Bontecou in 1940's, then present corp.

   b. Present Recreation, fishing, canoeing

4. DESIGN DATA

   a. Designed When Unknown

   b. By (name, address, phone #, business status)

   Unknown

   c. Geology Reports None known

   d. Subsurface Investigations None known

   e. Design Reports/Computations (H&H, stability, seepage)

   None known

4591

f. Design Drawings (plans, sections, details) None known

g. Design Specifications None known

h. Other n/a

5. CONSTRUCTION HISTORY

a. Initial Construction (per recollection of son of man who knew of construction)

1) Completed When 1905 ± , 1910 latest (inventory lists ✓ 1910)

2) By (name, address, phone #, business status) say 1905 Contractor unknown, but was built for Thornes family

3) Borrow Sources/Material Tests None known

4) Construction Reports/Photos None known

5) Diversion Scheme/Construction Sequence Unknown

6) Construction Problems None known

7) As-Built Drawings (plans, sections, details) None known

8) Data on Electrical & Mechanical Equipment Affecting Safe Operation of Dam No electric at dam. No data on gate known.

9) Other n/a

AD-A105 963 MALE (C T) ASSOCIATES SCHENECTADY NY F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. THORNES DAM (INVENTORY NUMBER --ETC(U)
JUL 81 K J MALE, W M SMITH DACW-81-C-0014

UNCLASSIFIED NI

2 OF 2
AD A
105963

END
DATE FILMED
11-81
DTIC

4576

b. Modifications (review design data & initial construction items as applicable & describe)

None known

c. Repairs & Maintenance (review design data & initial construction items as applicable & describe)

- Presently have application pending w/ DEC to do concrete repair work on spillway crest.
- No other records or work known.

6. OPERATION RECORD

a. Past Inspections (dates, by, authority, results)

- Oct. 18, 1978 by DEC (see App. F3-5), surface deterioration noted.

b. Performance Observations (seepage, erosion, settlement, post-construction surveys, instrumentation & monitoring records) No instrumentation, no observations or records known.

c. Post-Construction Engineering Studies/Reports

None known

d. Routine Rainfall, Reservoir Levels & Discharges

None known

4564

e. Past Floods That Threatened Safety (when, cause, discharge, max. pool elevation, any damage)

• Hurricane in 1950's caused W.L. to reach about 1.5' below porch floor of lodge (About 2.1' above spillway crest & about 0.4' below top of dam PAR level

f. Previous Failures (when, cause, describe) shots)

Bontecou family has home movies of event.

No failures known.

g. Earthquake History (seismic activity in vicinity of dam)

None known.

7. VALIDITY OF DESIGN, CONSTRUCTION & OPERATION RECORDS (note any apparent inconsistencies)

None Noted. Data very limited.

8. OPERATION & MAINTENANCE PROCEDURES

a. Operation Procedures in writing? No Obtain copy or describe. (reservoir regulation plan, normal pool elevation and status of operating facilities, who operates & means of communication to controller, mode of operating facilities, i.e., manual, automatic, remote)

• No flashboards on spillway, gate normally shut @ W.L. at spillway crest.

• Gate manually operated by putting a valve wrench on operating nut

(See 9. OTHER on F2+5)

b. Maintenance Procedures in writing? No Obtain copy or describe.

• Operator casually looks at dam several times per week on a random basis.

• Owner interested in preserving dam.

• Application is pending w/ DEC to do conc. repair work on spillway crest.

c. Emergency Action Plan & Warning System in Writing? No
Obtain copy or describe. (actions to be taken to minimize the D/S effects of an emergency)

- No thought given
- Probably call State Police & contract Wassaic Fire Dept.
- First dwelling is about 1.5 miles d/s at hamlet of Wassaic

9. OTHER

8a) Operation (cont'd)

- Gate operated 20 yrs. ago to drain pond for cleaning.
- Gate last operated October 1980 to lower W.L. so repair work on spillway crest could be done. Gate partially opened, but vandals used valve wrench to fully open gate. Pond drained in about 6 hrs. & caused high flows and heavy sediment d/s. The sediment caused fish kill, d/s complaints were lodged & DEC started court action against Owner.
- Gate is operable, but DEC has court order requiring Owner to keep gate shut.
- Would like to regularly exercise gate if DEC would allow.
- Pond took about 24 hrs. to refill after gate was shut in 1980.

2908

APPENDIX F

SECTION F3

COPIES OF ENGINEERING DATA AND RECORDS

TABLE OF CONTENTS

January 12, 1978
Wassaic, New York 12592

Hamilton Fish Jr.
25th Congressional District Office
319 Mill St.
Poughkeepsie, New York. 12601

RECEIVED
JAN 13 1978
POUGHKEEPSIE, N.Y.

Dear Sir:

My family and I are residents of the hamlet of Wassaic located in the southern end of the Town of Amenia. I know there is a dam located in the west mountains behind the ~~the~~ hamlet of Wassaic, that is holding back a large body of water. I have heard mention of a crack in this dam. If this is true I feel that this could be of potential danger to our hamlet. Whether the dam has a crack or not, my feelings are that the dam being many years old should be given a rigid inspection for safety as soon as possible.

It would be appreciated if you would look into this matter at your earliest convenience. I would also appriciate it, if you would keep me informed of your progress on this matter and what the rigid safety inspection turns up.

Yours truly,
M. [illegible] Pitman

DEC

...th District, New York

DISTRICT OFFICES:
POUGHKEEPSIE OFFICE
82 Market Street 12601
Phone: (914) 452-4220

PEEKSKILL OFFICE
738 South Street 10566
Phone: (914) 739-8282

KINGSTON OFFICE
232 Fair Street 12401
Phone: (914) 331-4466

Congress of the United States
House of Representatives
Washington, D.C. 20515

SMALL BUSINESS COMMITTEE
SELECT COMMITTEE ON THE OUTER CONTINENTAL SHELF

WASHINGTON STAFF:
JOHN D. BARRY
Administrative Assistant

MRS. AYA H. ELY
Executive and Appointment Secretary

JARED O. BLUM
Legislative Assistant

SHIRLEY CAVANAUGH
Case Worker

February 16, 1978

Mr. Delos D. Luther II
Box 206 - Furnace Hill Road
Wassaic, New York 12592

Dear Mr. Luther:

I have received your letter concerning Thorne's Dam, located near Wassaic, and I do appreciate your taking the time to write to me about the safety of this dam.

This is of particular interest to me as I understand that the Army Corps of Engineers has been conducting dam safety inspections, in conjunction with the New York State Department of Environmental Conservation.

I am taking the liberty of sending copies of your letter to both these agencies, and will be back in touch with you as soon as I receive a reply.

Thank you for giving me the opportunity to look into this matter for you, and with every best wish, I am,

Sincerely yours,

Hamilton Fish Jr.

Hamilton Fish, Jr.
Member of Congress

F:pt

DEC

File

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, NEW YORK
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

'78 FEB 27 PM 3:58

NANEN-F

23 FEB 1978

Honorable Hamilton Fish, Jr.
House of Representatives
Washington, D.C. 20515

Dear Mr Fish:

I am in receipt of a copy of your letter dated 16 February 1978, to Mr. Delos D. Luther II concerning the Thorne's Dam located near Wassaic, New York in Dutchess County.

As you may know, the National Dam Safety Program, authorized by the National Dam Inspection Act, Public Law 92-367 authorizes the Corps of Engineers to perform inspections of non-federal dams to identify deficiencies and dangerous conditions with a view toward determining if they constitute a hazard to human life or property. Our initial efforts are directed toward dams having a high or significant downstream damage potential. A report evaluating each dam is to be submitted to the Governor of the State and the owner of the dam. The State of New York is expected to undertake the management and execution of this very important program in the near future. An update and re-evaluation of the inventory will be conducted at that time.

Telephonic contact with the designated Department of Environmental Conservation representative for the dam program and a member of my staff confirmed our findings that this dam is not presently listed on the inventory. It was discovered, however, that this dam received a cursory inspection by the State in 1973. During this conversation it was mutually decided that, weather permitting, the State should make another inspection of this dam to determine; (a) its present condition, and (b) re-evaluate its potential for being included in the update of the dam inventory for a detailed inspection under the "National Dam Safety Program."

cc: Mr. George Koch

DEC

NANEN-F
Honorable Hamilton Fish, Jr.

Furthermore, the Corps of Engineers is very concerned with the integrity of all dams under our jurisdiction and would react immediately to mitigate the threat of impending failure. Mr. Luther's letter does not indicate cause for this type of reaction and a copy of this letter is being transmitted to the State for action as mentioned above.

If you have any questions regarding this matter please do not hesitate to contact my office.

Sincerely yours,

cc w/incls:
Koch, NYS DEC

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

DEC

1.

37-15-4
ev. 3/77)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DAM INSPECTION REPORT
(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class	Date & Inspector
791	Housatonic - L. Hudson	Amenia	Dutchess	B-C	10/18/78 KEVH

Stream = Wassaic Owner = Turkey Hollow Inc.

Type of Construction

- [x] Earth w/Concrete Spillway
- [x] Earth w/Drop Inlet Pipe
- [ ] Earth w/Stone or Riprap Spillway
- [ ] Concrete
- [x] Stone
- [x] Timber
- [ ] Other _____

Use

- [ ] Water Supply
- [ ] Power
- [x] Recreation - [ ] High Density
- [ ] Fish and Wildlife
- [ ] Farm Pond
- [ ] No Apparent Use-Abandoned
- [ ] Flood Control
- [ ] Other _____

Estimated Impoundment Size 10 - Acres ### Estimated Height of Dam above Streambed 25 Ft.

Condition of Spillway

- [x] Service satisfactory
- [ ] In need of repair or maintenance
- [x] Auxiliary satisfactory
- [ ] In need of repair or maintenance

Explain: _____

Condition of Non-Overflow Section

- [x] Satisfactory
- [ ] In need of repair or maintenance

Explain: _____

Condition of Mechanical Equipment

- [ ] Satisfactory
- [ ] In need of repair or maintenance

Explain: _____

Siltation [ ] High [ ] Low

Explain: _____

Remarks: Surface deterioration

Evaluation (From Visual Inspection)

- [ ] Repairs req'd. beyond normal maint.
- [x] No defects observed beyond normal maint.

DEC

DEC

October 23, 1978

Honorable Hamilton Fish, Jr.
House of Representatives
319 Mill Street
Poughkeepsie, New York 12601

RE: Dam #791
Thorne's Dam
L. Hudson

Dear Mr. Fish:

The referred to structure has been visually inspected by D.E.C. personnel. No major defects were found.

The dam appears large enough to be included in the update of the dam inventory. Therefore, the structure will receive a detailed inspection under the National Dam Safety Program.

If you have any questions regarding the above, please do not hesitate to contact this office.

Very truly yours,

Kenneth D. Harmer
Dam Safety Section

KDH:dr

DEC

APPENDIX G

DRAWINGS

NO DRAWINGS AVAILABLE